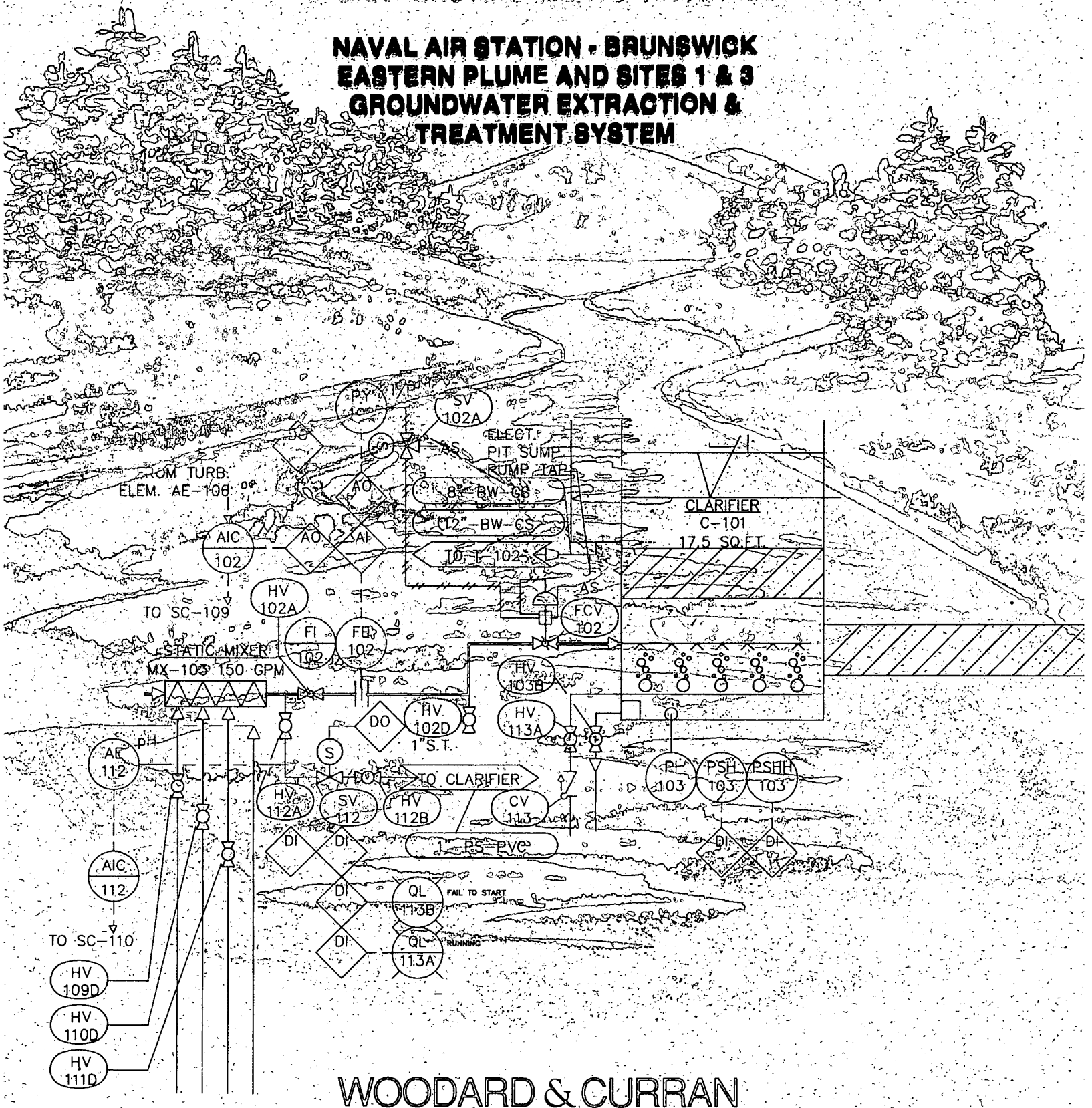
4/1/95

OPERATIONS AND MAINTENANCE PLAN

NAVAL AIR STATION - BRUNSWICK
EASTERN PLUME AND SITES 1 & 3
GROUNDWATER EXTRACTION & TREATMENT SYSTEM



WOODARD & CURRAN
ENVIRONMENTAL SERVICES

In Partnership With You

OPERATIONS AND MAINTENANCE PLAN

Sites 1&3, Eastern Plume
Groundwater Treatment System

Naval Air Station
Brunswick, Maine

April, 1995

Prepared by:

WOODARD & CURRAN
Environmental Services
41 Hutchins Drive
Portland, Maine
(207) 774-2112

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 BACKGROUND

Two contaminated groundwater plumes were identified at the Naval Air Station Brunswick (NAS Brunswick) through the U.S. Department of the Navy, Installation Restoration Program. The Sites 1 & 3 Landfill Plume is coming from the abandoned landfill while the Eastern Plume is coming from a former fire training area and from the former locations of leaking underground storage tanks.

Two groundwater extraction wells at Sites 1 & 3 Landfill are located in the former landfill and are designed to lower the water table to below the level of the wastes over a period of approximately two years. A slurry wall and low permeability cover were designed and are proposed remediation measures to keep the water table at this level after that. At the Eastern Plume, five extraction wells are located at the center and leading end to intercept the contaminated groundwater plume before it reaches Mere Brook and Harpswell Cove.

The groundwater treatment plant at NAS Brunswick is designed to use seven extraction wells to intercept these two plumes and treat the groundwater to remove most of the contaminants, and discharge the effluent to the Brunswick Municipal Wastewater Treatment Plant.

1.2 PURPOSE

This O&M Plan has been prepared in accordance with the U.S. Environmental Protection Agency's (USEPA's) Superfund Remedial Design and Remedial Action Guidance (US EPA, 1986a). This Plan was developed to serve as a guide for operation and maintenance during initial plant start-up. An O&M Manual will be prepared once actual equipment is selected, installed, and evaluated under operating conditions.

2.0 PLANT DESCRIPTION

2.1 PROCESS FLOW DESCRIPTION

The treatment plant receives flow from the two contaminated groundwater plumes. The first plume, identified as Sites 1&3 Landfill, will be pumped at a rate of approximately 20 gallons per minute and contains VOCs, including vinyl chloride, 1,2-dichloroethylene and methylene chloride; and inorganics, including arsenic, chromium, lead, iron, manganese, nickel and zinc.

Groundwater treatment for this plume consists of inorganic metals removal by potassium permanganate oxidation and pH adjustment with caustic soda to 10.0. These chemicals will be blended with the influent in the No. 1 Oxidation Tank. Potassium permanganate will be fed at about 1.5:1: ratio to iron concentration, and adjusted by oxidation-reduction potential (ORP) within the tank. Likewise, 20% caustic soda feed will be regulated by pH controllers, using about I gallon per 1,000 gallons of groundwater.

After chemical addition, water will flow by gravity to No. 2 flash mix tank and No. 3 flocculator located on the No. 4 inclined plate clarifier where about 1 mg/l polymer will be added to promote floc growth. The settled floc or sludge will be pumped to the No. 11 Sludge Holding Tank and the clarified liquid will flow to the No. 5 Greensand Filter Wet Well. At this point, the pretreated water's pH will be adjusted to approximately 6.5 with 60 percent sulfuric acid using less than 1/10th gallon for every I,000 gallons treated. Acid addition will be controlled by pH monitoring before being pumped to the two parallel No. 8 Greensand Filters. Turbidity monitoring will alert the operator that metals pretreatment is not operating properly. The Greensand filters will strain out large particles and remove additional iron and manganese. Iron is expected to be reduced from 1.0 mg/l to less than 0.5 mg/l, while manganese will be reduced from 2.0 mg/l to less than 0.4 mg/l. The Greensand filter effluent will be combined with the second contaminated groundwater source, the Eastern Plume (pretreated as described below), for final treatment in the No. 9 Ultraviolet-Oxidation (UV-Ox) Unit.

The Eastern Plume has five extraction wells (EW 1-5), which will pump a total of approximately 110 gallons per minute of groundwater containing VOCs, including 1,1-dichloroethylene, 1,2-dichloroethylene, 1,1,1-trichloroethane, trichloroethylene, 1,1-dichloroethane and tetrachloroethylene; and inorganics, including trace amounts of iron and manganese.

Treatment for the Eastern Plume groundwater will consist of greensand filtration to assure low iron and manganese concentrations, and UV-Ox treatment to remove VOCs to low levels. The groundwater will be mixed with potassium

permanganate, controlled by ORP in the No. 7 Equalization Tank initially, then after filtration through the two parallel flow No. 6, Greensand filters, the Eastern Plume groundwaters will combine with pretreated Sites 1&3 Landfill groundwater for final treatment in the No. 9 UV-Ox unit. Hydrogen peroxide will be added at about 50 mg/l (50% solution strength) to supply the oxidant. The ultraviolet light acts to help breakdown chemical molecules, thus, the VOCs will be reduced in concentration. The treated water will be stored in the No. 10 Backwash Tank, which will overflow to the No. 11 Effluent Wetwell, and finally to the Brunswick Sewer District's sewer collection system and municipal wastewater treatment plant.

Solids are generated in the oxidizing of metals when treating Sites 1&3 Landfill groundwater at the clarifier and when backwashing the green sand filters on both groundwater streams. A separate treatment and handling system is provided to thicken and dewater the solids for proper off-site disposal.

The green sand backwash process will be operator initiated. When head loss through the filter reaches a predetermined point, such as 10 psi, the operator will start the backwash sequence, which automatically resets the valves for backwashing. The operator will start one backwash pump (i.e., No. 10A) thereby reversing flow through the filter for a predetermined time period. At the end of the cycle, the backwash pump is manually de-energized. The backwash water drains to the No. 15 Recycle Wetwell. These backwash solids will then settle out in the No. 4 inclined plate clarifier when the recycle wetwell pumps pump these solids to the Sites 1&3 Landfill influent. Pumps in the No. 15 Recycle Wetwell recycle the water to Oxidation Tank No. 1 at a 10 gpm rate, but can be manually increased as flows at Sites 1 and 3 decrease over time.

Solids generated when the Sites 1&3 Landfill groundwater is oxidized in the No. 1 Oxidation Tank settle to the bottom of the No. 4 inclined plate clarifier and have to be periodically pumped to the No. 12 Sludge Holding Tank.

The No 12 Sludge Holding Tank contains three decant ports used to return clear supernate that separates from the solids near the top of the sludge, through the No. 15 Recycle Wetwell, back to the Sites 1&3 landfill influent. The operator will visually decant the clear liquid so the heavier solids can be pumped to the No. 13 Day Tank. If necessary, the day tank solids are mixed with polymer to enhance its drainability. When the valves are properly adjusted, the filter press and sludge pump are activated, thus initiating the press cycle. The liquid filtrate is recycled to the No. 15 Recycle Wetwell and the filter cake is deposited into 55-gallon drums for eventual off-site disposal.

2.2 PROCESS FLOW/EQUIPMENT FUNCTION DESCRIPTIONS

Extraction Well 1-7.

Seven extraction wells are installed to extract contaminated groundwater and pump the water to the groundwater treatment plant (GWTP). Two of the wells (EW 6&7) are located at Sites 1 & 3 Landfill, the other five wells (EW 1-5) are installed to intercept the Eastern Plume. Each is fitted with a submersible well pump, sampling port, flow meter, local flow indicator and level meter. The two wells at Sites 1 & 3 Landfill are expected to pump a total of approximately 20 gallons per minute of groundwater for approximately two years. The five wells within the Eastern Plume are expected to pump at a total rate of approximately 110 gallons per minute for as long as it takes to achieve the treatment goals.

Collection Piping (Force Main).

The discharges from EW 6&7 are manifolded into one 2" diameter HDPE force main. The discharge from EW 1-5 are manifolded into another 4" HDPE force main. The two forcemains then run buried to the GWTP.

No.1 Oxidation and pH Adjustment Tank.

Following the primary flowpath, the first treatment unit that the extracted groundwater from Sites 1 and 3 Landfill enters is an No. 1 Oxidation and pH Adjustment Tank. In this tank, the pH of the incoming water is adjusted to 10.0 by the addition 20% caustic soda, at a ratio of approximately 1 gallon per 1,000 gallons of groundwater. The ratio and flow of the caustic soda are controlled by a pH controller. The pH is increased to 10.0 to facilitate the precipitation of metal oxides formed during the oxidation step. The sensitivity of the pH controller must be adjusted to reduce the possibility for a pH overshoot. Potassium permanganate will also be added to the groundwater to oxidize iron in the groundwater from ferrous, a soluble form of iron, to ferric, a less soluble form of iron. Potassium permanganate will be fed at a ratio of approximately 1.5:1 to iron concentration, and adjusted by an oxidation-reduction (ORP) probe and controller at the tank. A potassium permanganate solution will be batched on-site by mixing dry potassium permanganate with water in tank 1A and pumping it with a chemical feed pump into the Oxidation Tank No. 1.

Caustic soda is stored in a bulk storage tank, which is filled by delivery truck through a hose station located on the outside of the building. The caustic soda tank has secondary containment in case of spills or leaks. Duplicate pumps are

provided to deliver caustic soda to the oxidation tank. A separate potassium permanganate metering system is provided. Potassium permanganate is prepared at the site by mixing solid potassium permanganate with plant water in a mix tank and then delivering this solution to the Oxidation tank with redundant chemical metering pumps. Redundant pumps are provided in several locations throughout the treatment process to allow for continued operation while a pump is undergoing routine maintenance or repairs.

No.2 Rapid Mix Tank.

The rapid mix, flocculation and clarifier process are all incorporated into one unit but are described as separate processes. In the No. 2 Rapid Mix Tank, a polymer solution is added to the groundwater and stirred vigorously. The polymer feed pump will be paced off the incoming flowmeter to ensure an even polymer dose should the flow vary. The polymer acts as a flocculation aid by forming interparticle bridges. In the Rapid Mix Tank the primary objective of mixing is to evenly distribute polymer throughout the water being treated. Consequently, the water in the rapid mix tank is mixed vigorously but has a short detention time. Polymer is prepared manually on-site by adding a dry anionic polymer into Polymer Mix Tank 2 A using an educator that mixes polymer with the appropriate amount of plant water. The polymer is mixed until well incorporated. An anionic polymer will be used and metered to achieve a concentration of approximately 1 mg/l. Actual polymer type and dose will be determined based on bench-scale jar tests and observation of full-scale operation. One metering pump is provided for supplying polymer to the rapid mix tank.

No. 3 Flocculation Tank.

In the No 3. Flocculation Tank, the precipitated metals are allowed to coagulate into larger particles that can be removed by gravity. Groundwater in the tank is mixed to promote collisions between individual precipitated metal particles. Collisions, with the help of the polymer, result in the formation of larger particles. The mixing rate should be high enough to prevent settling of the floc particles in the Flocculation Tank, but should not be so fast as to shear the floc particles formed.

No. 4 Inclined Plate Clarifier.

The No. 4 Clarifier is used to remove the coagulated metals from the groundwater. These solids are allowed to settle in the tank where they are concentrated and pumped out to the sludge decant tank. Clarified water flows over the exit weir at the top. The Clarifier includes inclined plates that provide a greater effective surface area, to reduce velocity of the water and allow coagulation to occur.

No. 5 Green Sand Filter Wetwell.

Clarified groundwater from the clarifier will gravity flow to the No. 5 Green Sand Filter Wetwell. The pH of the groundwater will be lowered at this point by the addition of 60% sulfuric acid. Sulfuric acid will be pumped with a chemical metering pump from a 55-gallon drum to the wetwell. Based on an anticipated feed rate of 0.1 gallons of acid to 1,000 gallons of flow, a drum of acid should last approximately two weeks. The feed rate will be controlled by a pH controller in the wetwell. At the wetwell, potassium permanganate will also be added to the groundwater to continually renew the green sand. Potassium permanganate will be adjusted by a oxidation-reduction (ORP) probe and controller at the tank.

No. 7 Eastern Plume Equalization Tank.

Under the primary flowpath, the first treatment unit that the extracted groundwater from the Eastern Plume enters is the No. 7 Eastern Plume Equalization Tank. Potassium permanganate may be added to the groundwater to oxidize iron in the groundwater from ferrous, a soluble form of iron, to ferric, a less soluble form of iron. Potassium permanganate will be fed at a ratio of approximately 1.5:1 to iron concentration, and adjusted by a oxidation-reduction (ORP) probe and controller within the tank. With low ion concentrations of 1.0 mg/l or less, potassium permanganate will be added to continually renew the green sand.

No. 6 & 8 Green Sand Filters.

After initial treatment, Site 1 & 3 Landfill and Eastern Plume groundwater will be pumped through Nos. 6 &8 Green Sand Filters. The flow from each of the two streams will flow through four pressure sand filters; two parallel filters for each stream. The green sand filters will strain out large particles and remove additional iron and manganese. Iron is expected to be reduced from 1.0 ml/l to less than 0.5 mg/l and manganese from 2.0 mg/l to less than 0.4 mg/l. Turbiditiy

monitoring on both the influent and effluent of the green sand filters will alert the operator that the filters are not working properly.

Periodically, the sandfilters will be backwashed. This process will be initiated by manually starting the system. The frequency of backwash will be determined by a number of factors, including turbidity, metals reduction, and time. Water for the backwash process will come from the Backwash Storage Tank. This tank collects treated water from the effluent of the ultraviolet oxidation unit before being discharged as plant effluent. Backwash water is pumped through two pumps back through the sand filters. This water, along with all flushed particles from the filters, will flow to the recycle wetwell. As discussed previously, the green sand will be continually renewed by addition of potassium permanganate.

No. 9 UV Oxidation Unit.

The green sand filter pumps are used to pump the pretreated groundwater from the No. 5 Greensand Filter Wetwell and raw groundwater from the No. 7 Eastern Plume Equalization Tank through the No. 9 UV Oxidation Unit. Hydrogen peroxide is added to the groundwater before it enters the UV oxidation unit. Hydrogen peroxide is added as a 50 percent solution to achieve a concentration of approximately 50 mg/l in the groundwater. In the UV oxidation unit, water is irradiated with ultraviolet light. In the presence of UV light, hydrogen peroxide forms hydroxyl radicals, which are strong oxidizers that will oxidize organic and inorganic molecules. It is expected that organics (except 1,1-dichloroethane [1,1-DCA]) will be fully oxidized to end products (e.g., carbon dioxide) that do not pose a health hazard. Residual metals from the pretreatment may also be oxidized; however, remaining concentrations of oxidized metal hydroxide species meet discharge criteria. Treated groundwater will exit the UV oxidation system, flow through the backwash storage tank, and exit the treatment plant.

The hydrogen peroxide is stored in a bulk tank. It is delivered in bulk by truck and transferred to an internal tank with secondary containment. Two metering pumps are available for dosing hydrogen peroxide into the static mixer before the UV oxidation unit.

Effluent Monitoring Manhole.

Flow exiting the groundwater treatment plant will flow through the Effluent Manhole No. 4. Here, sanitary wastewater from the treatment plant building will join and discharge to the NAS sewer system. The NAS sewer enters the Town of Brunswick sewer system and is treated at the municipal wastewater treatment facility.

No. 12 Sludge Decant Tank.

Solids from the clarifier are transferred by an air-operated diaphragm pump to the No. 12 Sludge Decant Tank, where they are allowed to settle and thicken further. The supernate from the thickened sludge is decanted off the top and drained to the recycle wet well. The thickened sludge is periodically pumped to the sludge day tank by another air-operated diaphragm pump. The volume of sludge produced and transferred to the day tank will depend on the volume produced by the clarifier.

No. 15 Recycle Wetwell.

The No. 15 Recycle Wetwell collects decanted water from the sludge decant tank, filtrate from the sludge filter press, backwash water from the green sand filters, and wash water from the treatment plant floor trench. This water is pumped through one of two submersible pumps back to the Sites 1 & 3 oxidation tank at a rate of 10 gallons per minute. This rate can be manually increased over time as the flow from Sites 1 & 3 Landfill decrease over the first two-year period. This wetwell is equipped with a pH monitoring system to alert the operator to any potential excessively low or high pH conditions.

No. 13 Sludge Day Tank.

Sludge from the No. 13 Sludge Decant Tank is pumped to the day tank where a polymer is added to help improve the ability of the filter press to dewater the sludge. From the day tank, sludge is pumped to the filter press using the same diaphragm pump as is used to pump sludge from the sludge thickener to the sludge day tank. The source and destination of material transferred by this pump are regulated by valves in the piping system.

No. 15 Sludge Press.

Sludge is pumped to the No. 15 Sludge Filter Press at a maximum pressure of 100 pounds per square inch (psi). Pressure is maintained by an automatic pump control. Porous plates in the press allow water to escape, thus increasing the solids concentration to 20 percent or greater. The filter press takes approximately three hours per cycle. Filtrate is drained to the No 15 Recycle Wetwell. The filter cake is removed from the press at the end of the cycle by

opening the chambers one at a time. When the plates have been opened, the sludge will fall into two 55-gallon drums below. An estimated 54 cubic feet of sludge will be generated monthly, assuming the solids dewatering process is operated 6 days per month and influent concentrations and flow rates are at the design values with treatment seven days a week.

Air Compressor.

Plant air pressurized at 125 psi is supplied by a 120-gallon dual reciprocating air compressor. Compressed air is required to operate control valves, diaphragm pumps, the sludge filter press and other miscellaneous equipment.

Programmable Logic Controller/Computer Interface

A programmable logic controller (PLC) is used to automate most of the treatment operations. Signals from various pieces of equipment will transmit data, such as flow, level pH, turbidity etc., to the PLC. This data will be used to control the process, alert the operator to alarm conditions, and log historical data to a data reporting and storage system. The PLC can be accessed through four different personal computers (PCs). The primary PC will be located in the control room. Additional PCs will be located in the base fire department and base engineering building. These two PCs will be hard-wired to the primary through individual modems. The fire department PC will have a software lock so as not to allow inadvertent access to the plant control system. This fire department PC will be used primarily to alert fire department personnel to alarm conditions at the plant during unstaffed hours. In the event of an alarm condition during unstaffed hours, the control system will alert the operator by way of a pager connection through a telephone line modem. The fourth PC access will be through an additional outside telephone line modem. This will allow the operator to access the PLC through a portable laptop computer while off site. With this modem access, the operator can respond to alarm conditions and make any necessary conditions or shut down the system as necessary.

Table 2-1
Influent Quality and Discharge Criteria

Parameter	Treatment Objective (µg/l)	Design Influent Concentration (µg/l)
Sites 1 & 3		
Organics*		
Vinyl Chloride	2	180
1,2-Dichloroethylene (total)	70	60
Methylene Chloride	5	460
Inorganics		
Arsenic	50	107
Chromium	10	11
Lead	15	60
Iron	400	100,000
Manganese	100	3,500
Nickel	78	78
Zinc	200	279
pH (maximum)	8.0 s.u.	
pH (minimum)	6.0 s.u.	
Turbidity	50 ntu	
*also contains Benzene, Toluene, ethylbenzene, and m,p,o-xylenes below MCLs		
Eastern Plume		
Organics		
1,1-Dichloroethene	7	110
1,2-Dichloroethylene (total)	70	89
1,1,1-Trichloroethane (TCA)	750	1,480
1,1,2-Trichloroethylene	5	615
1,1-Dichloroethane	94	94
Tetrachloroethylene	5	8
Inorganics		
Iron	400	<1,000
Manganese	100	<200
pH (maximum)	8.0 s.u.	
pH (minimum)	6.0 s.u.	
Turbidity	50 ntu	

To avoid repeated start-up and shutdown of the extraction and treatment system, deactivation of the system will be based on observations of water quality at the site. Estimates of the time required to reduce constituent concentrations to below treatment objectives at the site range from 2 to 3 years for Sites 1 & 2 and over thirty years for the Eastern Plume. Although measured concentrations at the extraction well will also be evaluated, deactivation will be assessed on hydrogeologic evaluation of groundwater quality at the site and the estimated concentrations at the plume under unstressed (not pumped) equilibrium conditions.

3.0 NORMAL OPERATION AND MAINTENANCE

Although the GWTP is designed to run automatically, to minimize manual control under normal operating conditions, this system will require oversight and maintenance for proper performance. This section lists the O&M tasks required along with a preliminary schedule of the frequency at which these tasks should be performed. Also included in this section are procedures for plant start-up and shutdown.

3.1 OPERATION TASKS

Operating tasks include the following actions:

a. Check calibration of pH and ORP probes and turbidity meters

b. Alternate duplicate pumps.

c. Dewater sludge.

d. Monitor & record levels in chemical storage tanks and arrange delivery or prepare chemical solutions as necessary.

e. Perform bench-scale jar tests to improve metals removal efficiency as necessary.

f. Perform routine sampling to evaluate treatment performance (see Section 5.0).

g. Prepare dewatered sludge for off-site disposal.

h. Check flocculation mixer speed and adjust as necessary.

I. Check flow rates to various equipment and adjust as necessary.

j. Record total flow rates and treatment plant down time.

k. Backwash Greensand Filters before turbitiy meters indicate breakthrough or plugging.

l. Inspect pumps, piping and other mechanical equipment for problems and wear.

m. Complete operational records daily, prepare summary reports of operation and maintenance.

n. Lubricate pumps, mixers and other mechanical equipment according to the equipment O&M data.

o. Maintain hot air furnace, oil storage equipment and building ventilation equipment according to O&M data.

p. Receive and handle all chemicals in compliance with the NAS Brunswick SPCC Plan and Hazardous Waste Contingency Plan.

q. Handle, label, containerize and dispose of all sludge produced, whether hazardous or nonhazardous, in accordance with NAS Brunswick Facilities Response Plan, SPCC Plan, Hazardous Waste Contingency Plan and Stormwater Pollution Protection Plan.

r. Report and clean up all chemical spills in accordance with NAS Brunswick SPCC Plan, Hazardous Waste Contingency Plan and Stormwater Pollution Protection Plan.

3.2 MAINTENANCE TASKS

Maintenance tasks include the following actions:

a. Remove and inspect the extraction well pumps according to the manufacturer's recommendations, check pump amperage draw for indications of pump wear or well plugging.

b. Inspect and maintain electrical motor control centers, breakers, and wiring to ensure proper operation.

c. Remove and inspect recycle wetwell pumps according to manufacturer's instructions.

d. Grease bearings and replace seals on all pumps as recommended by the manufacturer.

e. Check, inspect, and maintain the air compressor and exhaust fans as recommended by the manufacturer.

f. Review data on flow rates to identify any malfunctions of the automatic flow controllers and adjust as required.

g. Inspect tanks, piping and process equipment for leaks, wear or abrasions.

h. Check pH, ORP and turbidity data to identify any malfunctions of the automatic controllers and readjust as necessary.

i. Verify that UV oxidation system is functioning properly, including automatic bulb cleaning system, and replace lamps as per manufacturer's instructions.

j. Inspect mixers for proper operation and maintenance according to manufacturer's instructions.

k. Inspect fuel oil storage tank and piping for leakage, have fuel supply replenished as necessary.

l. Maintain building and grounds.

3.3 FREQUENCY OF O&M TASKS

A schedule of frequency is shown for each O&M task in Table 3-1. Daily tasks need only be performed 5 days per week. However, personnel will be available on call 24 hours per day to ensure that the system operates properly.

TABLE 3-1
FREQUENCY OF OPERATION AND MAINTENANCE TASKS

Task Description	FREQUENCY			
	Daily	Weekly	Monthly	*Other
Calibrate pH and ORP probes		X		
Calibrate turbidity meters		X		
Alternate duplicate pumps			X	
Dewater sludge				(1)
Record levels in chemical tanks	X			
Perform bench-scale jar tests				(2)
Perform routine performance sampling	X	X	X	
Prepare sludge cake for disposal				(3)
Check flocculation mixer speed	X			
Check influent and effluent flow rates	X			
Record total flow treated and down time	X			
Maintain grounds		X		
Inspect pumps for signs of problems	X			
Backwash green sand filters				(4)
Complete records and summary reports	X			
Remove and inspect well pumps				(5)
Inspect and maintain electrical components			X	
Grease seals and replace mechanical seals on pumps				(6)
Inspect air compressor, fans and blowers				(7)
Review data on flow rates		X		
Review pH, ORP and turbidity data		X		
Check metering pump rates		X		
Verify that UV lamps are operating	X			
Inspect influent and effluent piping			X	
Inspect mixers		X		
Inspect flowmeters			X	
Inspect and inventory fuel oil tank		X		

(1) Dewater sludge when sufficient solids have accumulated to complete a sludge press cycle.

(2) Perform bench scale jar tests as needed, in order to keep plant running at best efficiency, or when polymer suppliers change,

(3) Dispose of sludge every 90 days if analysis indicates it is hazardous and, if non-hazardous, dispose of sludge when sufficient volume has accumulated for a full truck load.
(4) Backwash Greensand Filters prior to plugging or breakthrough or as needed.
(5) Remove and inspect well pumps when pumping efficiency indicates there may be pump or screen plugging or failure or as recommended by the manufacturer.
(6) Maintain mechanical seals as per manufacturers O&M data.
(7) Maintain air compressor as per manufacturers O&M data

3.4 PLANT START-UP/SHUT-DOWN PROCEDURES

The following general start-up procedure will be followed for the groundwater treatment plant during the thirty-day start-up period and the initial months of the prove-out period. After plant start-up, an O&M Manual will be developed for the remaining prove-out period and subsequent operations.

1. Ensure that the valves in the process piping are in the correct position for the pump series being started. Fill all the tanks, process piping and process equipment with potable water. Sludge tanks may be filled, inspected, and drained to other tanks. All other tanks should be full of potable water prior to starting the extraction pumps. With the process tanks full of water, start the process mixers from the local control switch.

2. Determine which series of duplex process and chemical feed pumps will be used (i.e. P-7B1 or P-7B2). If series "1", check that suction and discharge valves are in an open position and that its circuit breaker is energized; check that the suction and discharge valves on the companion "2" pump are closed and that its circuit breaker is deenergized. Ensure that all other valves are in an appropriate position so the flow from each pump has an unobstructed path to the appropriate destination. Start each of the process pumps at the control panel by activating the appropriate Hand-Off-Auto (HOA) switch.

3. Start chemical feed pumps for sulfuric acid (H_2SO_4), caustic soda (NaOH) and potassium permanganate ($KMnO_4$) systems. To activate these systems, energize the circuit breakers for the "1" series pumps and deenergize the power to the "2" series pumps. Open all suction and discharge valves to the "1" series pumps and close all suction and discharge valves to the "2" series pumps. Place the local power switch to the ON position (the H_2SO_4 and NaOH pumps will not start pumping until flow through the plant starts). The PLC will pace the chemical feed

pumps by varying the pump stroke speed. The pump stroke length will have the be manually adjusted to ensure the proper dosage of KMnO4 at (1.5:1 ratio to iron concentration at Tank 1 and at a rate that maintains a slight pink residual at Tank 5 and Tank 7). The chemical feed pump speed rate at the H_2SO_4 and NaOH pumps should be set low, then gradually increased as necessary so that the PLC can maintain the proper pH without overshooting the setpoint.

4. Ensure that the ultraviolet oxidation system (UV-OX) is full of potable water. Verify that the suction and discharge valves on the "A" series H_2O_2 chemical feed pumps P-9A1 are open and that the suction and discharge valves on P-9A2 are closed. Open the potable water valve and allow approximately 20 gpm of clean water to flow through the unit. Start the H_2O_2 feed system by activating the pumps from the control system and ensure that H_2O_2 is flowing to the unit. Start the UV-Ox system by activating each of the HOA switches for each of the six chambers and then activating the lamp control switch. With flow through the unit and the lamps activated, test the unit effluent for H_2O_2 residual using test strips.

5. Start each extraction pump, one at a time at the control panel, and check flow rates and pressures from each well. Verify that each of the extraction wells is being pumped by observing whether the influent flow meter (FE 166 or FE110A) indicate an increase in flow as each well pump is started. Throttle the discharge of each of the pumps to approximately 19 gallons per minute (GPM). This will provide a combined plant flow of approximately 133 GPM. Local flow indicators and flow control valves are located in the concrete vaults at each of the extraction wells. Entry into the vaults is not required for these readings as the local indicators are readable from the vault entry door.

6. When at least thirty gallons per minute of flow is coming into the plant from the extraction wells, close the potable water connection to the UX oxidation unit.

7. Observe operation and determine need for adjustments. Check and document the following and correct any deficiencies.

   - Extraction well pumps are functioning correctly;
   - Tanks and mixers are sound and functional;
   - Inclined plate clarifier and associated equipment function correctly;
   - Sand filters function correctly;
   - The Ultraviolet Oxidation system in working properly;
   - All pumps function properly;

- Chemical feed pumps are supplying correct dose;
- No tanks are over filling;
- No buildup of sludge in non-sludge tanks, equipment or piping;
- Instrumentation and control components operate properly; and,

8. Collect water samples and perform analysis to evaluate treatment effectiveness as described in Section 5.0 for start-up monitoring.

9. After the plant has been running, the sand filters will need periodic backwashing. Monitor the influent and effluent turbidity along with the pressure differential; when the predetermined pressure differential as been reached, activate the backwash cycle for one of the sand filter vessels and start the backwash pump from the control panel HOA switch. Starting this pump will start a timer and begin the backwash flow to the sandfilter. Backwash water and any reject solids from this operation is directed to the recycle wetwell. When the backwash cycle is complete, discharge from the backwash pump will be automatically redirected to the backwash wetwell until the pumps shut off. Timers on the backwash cycle of the sandfilter control panel will be coordinated with the backwash pump timers so that the backwash pumps do not continue to run after the backwash cycle is complete.

10. Sludge generated in the clarifier will be pumped from the clarifier hopper bottom to the sludge thickener. This transfer pump is run from a timer on the control panel. The frequency of the transfer of this sludge will depend on the rate of sludge buildup. Sufficient volume will be allowed to accumulate in the clarifier to help compact the sludge. When the sludge reached the third sampling port, the transfer pump P-4A will be activated to pump sludge from the clarifier to the Sludge Thickener No. 12. When the sludge accumulation rate has been determined, the timer will be set to the appropriate pumping duration.

    As sludge accumulates in the thickener, additional settling will happen. As the sludge continues to concentrate, a clear supernatant will develop. This will be decanted slowly into the Recycle Wetwell where it will eventually be pumped back to Tank 1. When a sufficient volume of thickened sludge has accumulated, activate pump P-12A to transfer the sludge to the Sludge Day Tank 13 (make sure the suction and discharge valves have been realigned to the appropriate position). Start Mixer M-6 from the control panel to keep the sludge in suspension. In Polymer Mix Tank 13A, batch dry polymer into a water solution and pump with Polymer Pump 13A to Sludge Day Tank 13. Allow the polymer to mix with the sludge, then prepare the Sludge Press 14 for a press run.

Close the press plates with the switch at the press control panel. Ensure that the four filtrate valves are open to the Recycle Wetwell and that the press feed valve is open. Adjust the suction and discharge valves on pump P-12A to transfer the conditioned sludge in the Sludge Day Tank to the Sludge Press. Timers on the press control panel will automatically adjust the pumping rate to the press, increasing the pressure through the press cycle. The press is full when the pump stops pumping. When this happens turn off the air to the feed pump and close the sludge feed valve. Open the air drier line and blow down the press to remove all excess water. When water flow from the filtrate stops, open the press and allow the sludge cake to drop into the 55-gallon drum below. When the plates are empty, remove the drum and wash the press with a hose to prepare it for the next press run. The drum of sludge will be labeled and dated, then prepared for disposal.

The following general procedures will be followed during shutdown of the groundwater treatment. These procedures are intended for extended shutdown when all treatment tanks must be drained (i.e., during testing of compliance of groundwater under unstressed conditions).

1. Turn off extraction pumps and recycle treated process water to the equalization tank for 2 hours.

2. Treat all water in oxidation tank, green sand filter wetwell, and Eastern Plume equalization tank. Shut off acid and caustic metering systems. Shut off peroxide addition system and UV reactor. Shut off process pumps from the green sand filter wetwell, and Eastern Plume equalization.

3. Drain all remaining water from the oxidation tank, green sand filter wetwell, Eastern Plume equalization tank, and green sand filters into the recycle wet well.

4. Process all sludge generated in step 2 in the clarifier and sludge treatment system.

5. Pump all water in the recycle wet well into the oxidation tank and treat.

6. Allow the oxidation tank to drain into the clarifier.

7. Drain and process contents of the clarifier through the sludge treatment system.

8. Hose down the recycle wet well with treated process water until clear water is seen from the recycle wet well pumps.

10. Allow remainder of treatment system to operate until the green sand filter wetwell, the Eastern Plume equalization tank, and the backwash wetwell are each drained.

11. If the system is to be down for an extended period of time, use a portable pump to remove residual water from all tanks. If water is suspected to be incompletely treated, then drum water and sample for water quality parameters.

12. Empty chemical storage tanks and store or remove chemicals from the site properly.

13. Prepare all mechanical equipment for long-term shutdown as recommended by the equipment manufacturers.

14. Drain influent and effluent pipelines and flush force mains with clean water then allow to drain.

15. Prepare building for long-term shutdown.

4.0 POTENTIAL OPERATING PROBLEMS

4.1 POTENTIAL OPERATING PROBLEMS

The greatest likelihood of operating problems involve the mechanical malfunction of equipment. Mechanical equipment that could fail includes the following:

- Well pumps;
- Motorized valves;
- Flow measuring elements;
- Turbidity measuring element;
- pH and ORP measuring equipment;
- Process and chemical pumps;
- Heating and ventilation systems;
- Air compressor;
- Level control sensors;
- Diaphragm pumps;
- Filter press;
- Green sand filters; and,
- UV oxidation system.

There is a chance that an equipment failure could lead to a release of untreated groundwater, treatment chemicals or fuel oil to the environment. A Spill Control Plan, included in the OHM Environmental Protection Plan, has been developed to help minimize the environmental impact of any such release. A NAS Brunswick Base SPCC plan is also in place and will be adhered to. Plant personnel should be aware of these plans and be prepared to implement any appropriate instructions.

Mechanical components may be repaired or replaced by either site personnel or outside repair services. Built-in redundant systems should minimize plant shutdown due to equipment failure. If malfunctions occur in multiple equipment components, the plant can satisfactorily operate for a few days without adverse performance due to back-up systems. In many cases, similar equipment can be rented or purchased.

Failure of electrical equipment and components will most likely require outside repair service. Electrical malfunction can occur occasionally in motors and controllers of the above mechanical equipment, as well as in the following components:

- Programmable logic controllers (PLCs);

- Transformers;
- Motor contactors; and,
- speed controllers.

A situation that could have a severe impact on the treatment plant would be long-term power outages when the outside temperatures are below the freezing point. Since there are no emergency back-up power sources provided, temporary power supplies, such as emergency generators, or temporary heating equipment, such as propane heaters, may have to be employed to prevent freezing of process piping, tanks and equipment.

After power outages of three minutes or less, the plant should restart automatically unless the PLC detects a shut-down alarm condition such as an overflowing tank, out-of-range pH condition or an equipment restart failure. The Genesis computer control system will have an unintruptable power supply (UPS) which will enable the computer to keep running during short term power outages. The programmable logic controllers will have battery backup systems for their random access memory (RAM) which will keep any totalized data in RAM from being lost during power outages. The PLC will automatically restart when the power supply resumes. After power outages during which alarm conditions have occurred, such as a piece of equipment failing to restart, the plant will have to be manually brought back on-line.

Encrustation of the extraction well screens could result in a pump motor burnout if the low level detector fails to stop the pump. Several techniques to remove encrustation from well screens are possible. Evaluation of scale type and removal technique should be made by experienced hydrogeologists or well drillers. Depending on the complexity of the problem, the treatment facility operator may perform or subcontract well cleaning operations. After the first sixty days of pumping, the extraction wells should reach their pumping equilibrium, any flow decrease of more than ten percent may indicate the start of a plugging situation.

4.2 SOURCES OF INFORMATION REGARDING PROBLEMS

Manufacturer's instructions and operating guidelines are the first source of reference for most equipment malfunction. At times, a manufacturer's representative will be needed to repair equipment rather than servicing the equipment with on-site personnel. Often, electronic and electrical equipment repairs require trained service representatives. Most piping problems can be solved by local plumbers or pipe suppliers.

4.3 COMMON REMEDIES

To avoid operational and mechanical problems, a rigorous P&M program will be initiated. However, it is expected that unscheduled maintenance and equipment breakdowns will occur. Common remedies of problems include equipment repair, replacement, or bypassing. Repair and replacement are long-term remedies, bypassing is a short-term remedy. Often, a spare unit is used to correct a problem quickly while allowing time for repair. Redundant systems in place should eliminate the need for a plant shut down due to equipment failure.

4.4 AUTOMATIC PLANT SHUTDOWN

The PLC has been programmed so that certain alarms and events, which may occur during startup and normal operations, will automatically shutdown the operation of the treatment plant. These conditions include:

- Equalization Tank 7 low ORP
- Equalization Tank 7 high ORP
- Equalization Tank 7 high-High Level
- UV Unit 9 low flow alarm
- Sandfilter 6 high differential alarm
- Sandfilter 8 high differential alarm
- Sludge Thickener 12 high level alarm
- Recycle Wetwell 15 low pH alarm
- Recycle Wetwell 15 high pH alarm
- Recycle Wetwell 15 high-high level alarm
- Air Compressor 14A low pressure alarm
- KMnO4 Tank 7A low level alarm
- Backwash Storage Tank 10 low pH alarm
- Backwash Storage Tank 10 high pH alarm
- Greensand Filter Effluent 6&8 high turbidity alarm
- UV Unit 9 alarm
- Fire Alarm

In the event of a plant shutdown from any of these events, operator will be notified by beeper and will be able to acknowledge the alarm remotely via portable computer and modem. To restart the plant, the operator will have to correct the alarm condition on-site and restart the plant.

5.0 ROUTINE PERFORMANCE MONITORING

5.1 MONITORING TASKS

The three monitoring tasks required for evaluating treatment plant performance include:

- Monitoring during initial plant start-up (4 weeks),
- Routine long-term performance monitoring of the treatment plant effectiveness, and
- Routine sludge sampling for disposal requirements.

During the first 14-day of the 30-day start-up period, a gas chromatograph (GC) will be on-site to analyze samples for organic compounds. The GC will provide rapid results so that adjustments to plant operation can be made. Analysis for evaluation of the metals-removal process will be done by an off-site laboratory for metals analysis with a 24-hour turn around time for results (see Table 5-1). Hach test kit metals analysis will be done on-site for iron and magnesium in order to fine tune polymer and chemical dosages. During the first 14 days of operation, there will be 24-hour oversight of the treatment plant. The remainder of the start-up period (two additional weeks) will have 12-hour oversight during the day only.

On-site VOC analytical equipment will be available for the first two weeks of the start-up period. Over the system prove-out period, which lasts for 52 weeks following start-up, water samples will be taken on a periodic basis and analyzed for VOCs at an off-site laboratory for evaluation of the treatment plant performance. Off-site analysis will provide a higher level of data quality, but results will take longer to obtain.

In the event that the plant effluent does not meet treatment objectives for metals, a bench scale jar testing of chemical dosages will be performed in order to optimize metals removals. If increased VOC removals is required, than the UV system will be optimized. This can be accomplished by adjusting the light intensity in the UV/ox unit, adjusting the hydrogen peroxide dosage, or increasing the number of UV chambers in the unit.

Sludge generated from the filter press will be stored in 55-gallon drums. These drums will be disposed of at an appropriate off-site facility on a regular basis. Treatment plant operators will be required to take samples of the sludge for disposal characterization analysis prior to disposal.

5.2 SAMPLING LOCATIONS AND ANALYSES AND FREQUENCIES

During initial plant start-up, sample analysis from numerous locations will be used to evaluate the performance of individual treatment components. During the treatment system prove-out period, fewer sampling locations may be used to monitor treatment plant performance. Sampling locations, frequencies, and analyses are presented for both the system start-up and prove-out periods in Table 5-1. Additional locations may be selected as needed to evaluate specific problems encountered during operation.

An on-site gas chromatograph will be used to analyze for:

- vinyl chloride,
- 1,1-dichloroethylene,
- 1,2-dichloroethylene (cis),
- 1,2-dichloroethylene (trans),
- 1,1,1-trichloroethane,
- trichloroethylene,
- tetrachloroethylene

Metals analysis will be done by an off site laboratory in order to comply with NEESA 20.2-047B "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, June 1988". During the first two-week period the samples will be reported within twenty four hours, after that the standard laboratory turn around time will be used.

On-site metals analysis analyze for iron and manganese will be performed using field testing methods and equipment from HACH Chemical. These results will be used to fine tune polymer and chemical dosages.

Sludge samples will be taken and analyzed according to the requirements of the regulatory agencies and the selected disposal facility to determine if it is a hazardous waste. Analysis include RCRA Metals, Igniteability, reactivity, volatile organic compounds and semi-volatile organic compounds.

TABLE 5-1
TREATMENT FACILITY MONITORING SCHEDULE

ANALYTICAL PARAMETER	ON-SITE ANALYSIS FREQUENCY					OFF-SITE ANALYSIS FREQUENCY				
	SYSTEM START-UP			PROVE-OUT		START-UP			PROVE-OUT	
	DAY 1-4	DAY 5-14	DAY 14-30	WEEK 1-12	WEEK 13-52	DAY 1-4*	DAY 5-14	DAY 14-30	WEEK 1-12	WEEK 13-52
SITES 1 & 3 INFLUENT										
Flow rate instantaneous	Continuous			Continuous						
Flow rate daily average	1 day	1 day	1 day	1 day	1 day					
pH	Continuous			Continuous						
Arsenic						1/day	2/wk	1/wk	2 wks	1 mo.
Chromium						1/day	2 wk	1/wk	2 wks	1 mo.
Lead						1/day	2/wk	1/wk	2 wks	1 mo.
Iron						1/day	2/wk	1/wk	2 wks	1 mo.
Manganese						1/day	2/wk	1/wk	2 wks	1 mo.
Vinyl Chloride	4 hrs	8 hrs						1 wk	2 wks	1 mo.
1,2-Dichloroethylene (cis)	4 hrs	8 hrs						1 wk	2 wks	1 mo.
1,2-Dichloroethylene (trans)	4 hrs	8 hrs						1 wk	2 wks	1 mo.
OXIDATION TANK										
Caustic flow rate	1 day	1 day	1 day	1 wk	1 wk					
$KMnO_4$ flow rate	1 day	1 day	1 day	1 wk	1 wk					
pH	Continuous			Continuous						
ORP	Continuous			Continuous						
RAPID MIX TANK										
Polymer flow rate	1 day	1 day	1 day	1 wk	1 wk					
SAND FILTER WETWELL										
H_2S0_4 flow rate	1 day	1 day	1 day	1 wk	1 wk					
Arsenic						1/day	2/wk	1/wk	2 wks	1 mo.
Chromium						1/day	2/wk	1/wk	2 wks	1 mo.
Lead						1/day	2/wk	1/wk	2 wks	1 mo.
Iron						1/day	2/wk	1/wk	2 wks	1 mo.
Manganese						1/day	2/wk	1/wk	2 wks	1 mo.
EASTERN PLUME INF.										
Flow rate instantaneous	1 day	1 day	1 day	1 day	1 day					
Flow rate daily average	1 day	1 day	1 day	1 day	1 day					
pH	1 day	1 day	1 day	1 day	1 day					
Iron						1/day	2/wk	1/wk	2 wks	1 mo.
Manganese						1/day	2/wk	1/wk	2 wks	1 mo.
1,1-Dichloroethylene	4 hrs	8 hrs						1 wk	2 wks	1 mo.
1,2-Dichloroethylene (cis)	4 hrs	8 hrs						1 wk	2 wks	1 mo.
1,2-Dichloroethylene (trans)	4 hrs	8 hrs						1 wk	2 wks	1 mo.
1,1,1-Trichloroethane	4 hrs	8 hrs						1 wk	2 wks	1 mo.
Trichloroethylene	4 hrs	8 hrs						1 wk	2 wks	1 mo.
Tetrachloroethylene	4 hrs	8 hrs						1 wk	2 wks	1 mo.
UV OX UNIT INFLUENT										
H_2O_2 flow rate	1 day	1 day	1 day	2 wks	1 mo					
pH	1 day	1 day	1 day	2 wks	1 mo					
Turbidity	Continuous			Continuous						
Iron						1/day	2/wk	1/wk	2 wks	1 mo.
Manganese						1/day	2/wk	1/wk	2 wks	1 mo.
Vinyl Chloride	4 hrs	8 hrs						1 wk		
1,1-Dichloroethylene	4 hrs	8 hrs						1 wk		
1,2-Dichloroethylene (cis)	4 hrs	8 hrs						1 wk		
1,2-Dichloroethylene (trans)	4 hrs	8 hrs						1 wk		
1,1,1-Trichloroethane	4 hrs	8 hrs						1 wk		
Trichloroethylene	4 hrs	8 hrs						1 wk		
Tetrachloroethylene	4 hrs	8 hrs						1 wk		

TABLE 5-1 (CONTINUED)

ANALYTICAL PARAMETER	ON-SITE ANALYSIS FREQUENCY					OFF-SITE ANALYSIS FREQUENCY				
	SYSTEM START-UP			PROVE-OUT		START-UP			PROVE-OUT	
	DAY 1-4	DAY 5-14	DAY 14-30	WEEK 1-12	WEEK 13-52	DAY 1-4*	DAY 5-14	DAY 14-30	WEEK 1-12	WEEK 13-52
UV/OX EFF. / PLANT EFF.										
Flow rate-average daily	1 day	1 day	1 day	1 day	1 day					
pH		Continuous			Continuous					
Arsenic						1/day	2/wk	1/wk	2 wks	1 mo.
Chromium						1/day	2/wk	1/wk	2 wks	1 mo.
Lead						1/day	2/wk	1/wk	2 wks	1 mo.
Iron						1/day	2/wk	1/wk	2 wks	1 mo.
Manganese						1/day	2/wk	1/wk	2 wks	1 mo.
Vinyl Chloride	4 hrs	8 hrs						1 wk	2 wks	1 mo.
1,1-Dichloroethylene	4 hrs	8 hrs						1 wk	2 wks	1 mo.
1,2-Dichloroethylene (cis)	4 hrs	8 hrs						1 wk	2 wks	1 mo.
1,2-Dichloroethylene (trans)	4 hrs	8 hrs						1 wk	2 wks	1 mo.
1,1,1-Trichloroethane	4 hrs	8 hrs						1 wk	2 wks	1 mo.
Trichloroethylene	4 hrs	8 hrs						1 wk	2 wks	1 mo.
Tetrachloroethylene	4 hrs	8 hrs						1 wk	2 wks	1 mo.
SLUDGE DECANT TANK										
Thickened sludge total solids							1 wk	1 wk		
SLUDGE FILTER PRESS										
Filter cake total solids							1 wk	1 wk		

* these analysis will have 24-hour results.

TABLE 5-2
LABORATORY ANALYTICAL METHODS AND TREATMENT OBJECTIVES

Parameter	TREATMENT OBJECTIVES (µg/l)	ANALYTICAL METHOD
Vinyl Chloride	2.0	US EPA 8010
1,2-Dichloroethylene (total)	70.0	US EPA 8010
Methylene Chloride	5.0	US EPA 8010
1,1-Dichloroethylene	7.0	US EPA 8010
1,1,1-Trichloroethane	750.0	US EPA 8010
Trichloroethylene	5.0	US EPA 8010
1,1-Dichloroethane	94.0	US EPA 8010
Tetrachloroethylene	5.0	US EPA 8010
Arsenic	50.0	US EPA SERIES 200
Chromium	10.0	US EPA SERIES 200
Lead	15.0	US EPA SERIES 200
Iron	400.0	US EPA SERIES 200
Manganese	100.0	US EPA SERIES 200

5.3 SAMPLING EQUIPMENT AND PROCEDURES

5.3.1 SAMPLE CONTAINERS, PRESERVATION, AND HOLDING REQUIREMENTS

The specifications for sample containers, preservation, and management are presented in Table 5-3. All samples will be preserved in the field at the time of collection (when applicable) in accordance with Test Methods for Evaluating Solid Waste (SW-846) (USEPA, 1986b). Sample containers will be precleaned according to USEPA protocols by the supplier.

After the samples have been collected, they will be sent to the designated laboratory for analysis as expeditiously as possible to ensure that the most reliable and accurate results are obtained from analysis. As a general rule, storage at low temperature (4°C) is the best way to preserve most samples, although the length of time the sample can be held at low temperature varies with the analyte and matrix. Samples shipped off site will be packaged for shipping in insulated containers, constructed to ensure bottles will arrive intact at the laboratory.

When the samples are received at the laboratory, the time lapse between sample acquisition and analysis may not exceed the holding times shown in Table 5-3.

TABLE 5-3
SAMPLE CONTAINERS, PRESERVATION
AND HOLDING REQUIREMENTS

PARAMETER	MATRIX	CONTAINER	PRESERVATIVE	HOLDING TIME
Volatile Organics	Aqueous	two 40 ml vials w/ Teflon septias	HCl, cool 4°c	14 days
	Solid	glass with Teflon lined septas	cool 4°c	14 days
Inorganics	Aqueous	500 ml plastic or glass	HNO_3 to pH<2 filter W/ 0.45 micron filter, cool 4°c	6 months
	Solid	4 ounce glass soil jar	cool 4°c	6 months

5.3.2 Sampling Equipment and Procedures.

Samples can be withdrawn from the sample ports directly into sample vials. Prior to taking the sample, water will be allowed to flow freely out of the sample port to remove any solids or stagnant water that may have accumulated in the sample port. The sample port valve is then throttled back and labeled test vials containing preservative (if necessary) are filled and capped. No specific procedures are required for filling the sample bottle with the exception of VOC samples. VOC samples will be taken in duplicate and must be collected as specified below.

1. Uncap the sample bottle, taking care not to touch the Teflon-faced septum. If the septum is contaminated in any way, it should be replaced.

2. Fill the sample vial slowly, minimizing air entrapment, until the vial is completely full. Take care not to displace any preservative.

3. Place the Teflon-faced silicon rubber septa on the convex meniscus, Teflon side (shiny side) down, and screw the cap on.

4. Invert the bottle, tap lightly, and check for air bubbles.

5. If air bubbles are present, open the bottle, add sample to eliminate air bubbles, and reseal. Repeat this procedure until the bottle is completely filled and no air bubbles are detected.

During start-up, and potentially at other times, samples may be desired at points where a sample port is not available. In these cases, grab samples may be taken from the tanks as needed to obtain representative samples. Caution should be used to prevent accidents when collecting grab samples.

Sludge sampling should be conducted according to the requirements of the selected disposal facility. This sampling is likely to include some type of composite sample to represent all sludge in a particular shipment. If sampling equipment is used to collect samples, equipment will be rinsed with a detergent solution and rinsed with deionized water after each use. Exterior surfaces of sample bottles will be decontaminated, as necessary, prior to shipment.

5.3.3 QUALITY ASSURANCE/QUALITY CONTROL

The objective of performance monitoring is to verify the groundwater treatment system effectiveness and efficiency. To meet this objective, samples collected from the treatment system and sent to an off-site laboratory will be analyzed at

USEPA Level III Data Quality using the analytical methods presented in Subsection 5.2 (see Table 5-2). Data validation will not be required. Samples collected for on-site analysis will be analyzed using Level II analytical protocols.

5.3.4 CALIBRATION PROCEDURES

Required calibration of analytical instrumentation and wet chemistries at a laboratory are generally addressed by the laboratory's quality assurance program. Generally, initial and continuing calibrations, matrix spikes, method blanks, analytical duplicates, and calibration check samples are required to be analyzed and to be within specified acceptance ranges.

Any piece of equipment used for on-site analysis will be calibrated according to manufacturer or analytical specifications. On-site sampling equipment might include metals analysis kits and temperature, conductivity, pH, and ORP probes and turbidity meters. During plant start-up, an on-site GC will also require calibration. Calibration of pH and ORP probes and turbidity meters that are part of the process equipment should be calibrated weekly unless experience shows that more frequent calibration is needed. Equipment used for sampling will be calibrated, by the plant operator, with certified standard solutions each day they are used. Calibration of all on-site equipment will be documented in daily logs.

6.O ALTERNATE OPERATIONS & MAINTENANCE

This section presents some of the non-routine operation and maintenance that may be required if systems fail.

6.1 ALTERNATIVE PROCURES TO PREVENT UNDUE HAZARD

If systems fail for prolonged periods, some contaminants could escape from the extraction well capture zone. Daily or weekly outages should not result in off-site migration. The pumping rate can be increased to re-establish the capture zone if the extraction pump has been off for a long period. If the motorized valve controlling the well pump flow rate fails, the valve can be manually operated.

If the underground piping system fails, shut off the pumps and repair the line. An aboveground temporary bypass can be installed during warmer months, requiring an appropriate length of pipe, elbows and couplings. The bypass pipe could hinder removal and repair of the failed pipe.

If monitoring indicates that the treatment system is not consistently meeting discharge requirements, the treatment system will be adjusted and evaluated to optimize performance. If optimization is not effective, an alternative treatment may be evaluated. If the treatment system does not meet discharge criteria under the proposed treatment sequence, additional modifications (e-g., addition of new unit processes, treatment sequence modification, etc.) to the treatment system will be considered. The conditions will be reviewed with the Navy and a course of action will be developed.

In the event that the plant effluent does not meet the requirements of the Brunswick Sewer District permit during this evaluation period, and if sufficient in-plant effluent storage is not available, the treatment system will be temporarily shut down.

6.2 ANALYSIS OF VULNERABILITY AND ADDITIONAL RESOURCE REQUIREMENTS SHOULD A FAILURE OCCUR

Equipment failure is the most likely occurrence requiring outside repair. Likewise, electrical motors, electronic equipment, and electrical equipment will require outside repair. Electrical failure from storms will require supply from an emergency generator to sustain the heating system to prevent freezing of pipes and process equipment in the winter months. Equipment rental or replacement is possible for many items such as air compressors, sump pumps, process pumps, electric heaters, and well pumps.

Outside contractors may be needed to repair underground pipes or extraction wells. Electronic components are best diagnosed and repaired by authorized manufacturer's representatives.

7.0 SAFETY PLAN

7.1 PRECAUTIONS AND NECESSARY EQUIPMENT FOR SITE PERSONNEL

Accident prevention requires thoughtfulness, planning and the application of a few basic safety principles. Accidents include physical injury and dangers from noxious gases or vapors, or oxygen deficiency.

The prevention of physical injury begins with good housekeeping. Tools, parts, and other objects should not be left lying around. Warning signs, railings and covers in place can protect against low piping, open tanks, and open manholes or hatches. The simple knowledge that bending the knees and lifting with the muscles of the legs can save many sprains or injured backs or ruptures.

The Contractor is responsible to see that its personnel are fully instructed in the hazards of their work. The individual's responsibility is to himself. He must take the precautions to ensure personnel safety at work. All on-site personnel should be familiar with and adhere to the OHM Site-Specific Health & Safety Plan and the Safety Section (Section 7.0) of this O&M Plan. A copy of this plan will be available in the plant office. O&M personnel shall be trained in the following areas:

- Fire safety;
- Emergency procedures for evacuation and fires;
- Confined space entry;
- Lock/tag out procedures;
- Operation/maintenance/handling of electrical equipment;
- Hand and power tools;
- Material handling; handling and storage of hazardous materials; and
- Ladder safety;
- Hazardous Communications

Safety Laws and regulations do exist for the wastewater industry and these have been created to protect you. Federal laws are under the Occupational Safety and Health Administration (OSHA). The State of Maine has adopted all OSHA regulations and has developed other state regulations, both are administered by the Bureau of Labor. These laws are lengthy, hence it is recommended that you obtain the following publications:

1. Bureau of Labor Standards General Laws.

2. Safety/Health Standards for Water/Sewer Operations.

3. Chemical Substance Identification. Available from:

   Maine Department of Labor
   Bureau of Labor Standards
   State House Station 82
   Augusta, Maine 04333
   (207)289-2591

4. Code of Federal Regulations, Labor 29, Parts 1900 to 1910.

5. Construction Industry, 29 CFR, 1926/1910. Available from:

   United States Government
   Labor Department
   OSHA
   40 Western Avenue
   Augusta, Maine 04330
   (207)622-8417

These regulations were established to protect you from the dangers of your job, and to improve the quality of your life.

Information Hotlines

800-262-8200 **Chemtrec Non-Emergency Hotline.**
9:00 am to 6:00 pm EST. Chemical and chemical product health, safety and environmental information available to the public, industry or government.

202-366-4488 **DOT Hazardous Materials Information**
9:00 am to 4: pm EST. Answers to DOT regulations on Hazardous materials transportation.

703-821-4789 **RCRA Method Information Communications Exchange**
Open 24 hours per day. Provides information and document ordering of SW-846 methods.

800-424-9346
800-535-0202 **RCRA/Superfund/EPCRA Hotlines**
8:30 am to 7:30 pm EST. Both numbers answer questions pertaining to RCRA, Superfund (CERCLA) and Emergency Planning Community Right To Know legislation.

202-554-1404 **Toxic Substances Control Act (TSCA) Hotline**
8:30 am to 5:00 pm EST. Answers questions about TSCA regulations and asbestos hazardous emergency response act.

800-424-9300 **Chemtrec Non-Emergency Hotline**
Open 24 hours. For reporting all spills, releases fires, leaks and exposures. Notification of this organization is not required by law.

800-424-8802 **National Response Center Emergency Hotline**
Open 24 hours. For reporting spills and hazardous substance releases required for discharges of reportable quantities.

Rubber gloves are inexpensive and afford good protection to the hands. In wet places, boots or rubbers protect the feet from dampness and infection. Coveralls should be provided by the Contractor for its employees. Occupational Safety and Health Administration (OSHA)-approved safety helmets and glasses should also be provided and worn.

Wounds and cuts should be treated by a doctor and reported. No cut or scratch is too minor to receive attention. Wash and dry a minor cut and apply a bactericidal cream or ointment.

When handling vials containing sulfuric acid, hydrogen peroxide, or sodium hydroxide, wear chemical-resistant gloves and safety glasses to avoid spilling the contents. If accidentally spilled on the skin or garment, wash copiously with potable water immediately. Use emergency eyewash and showers for this purpose.

The following precautions should be followed to ensure safe working conditions around electrical equipment:

- A regular and organized program of preventive maintenance should be instituted for all plant electrical equipment to reduce or eliminate electrical hazards.

- Train all O&M personnel in the handling and use of electrical machinery and equipment.

To extinguish fires in electrical equipment, use only nonconducting extinguishing agents that minimize the shock hazard to the Operator and do not permanently damage the equipment, such as carbon dioxide or dry chemical extinguishers.

- Use properly sized and set electrical overload devices that will function when an overload or short circuit occurs.
- Allow only licensed and qualified electricians to work on any part of the electrical systems.
- Provide lockout switches and tags on the controls at all off-site or remotely located electrical equipment for use during maintenance, repair, and other nonroutine work.
- Use wood or other nonconductors for ladders, and in an emergency use dry wood to move live wires that might have fallen.
- Do not work on energized equipment.
- Use emergency stop buttons to isolate electrical equipment (remote from the main control center) and tag the equipment "out-of-service."
- Be sure electrical controls, switch boxes, and distribution panels are identified and easily accessible.
- Safety tools, special devices, and protective clothing should be used when working on or near energized circuits.
- Consider using rubber matting at control centers and operating stations.

The above recommendations do not include safety precautions that may be identified by staff through normal work experience.

Personnel should know where fire extinguishers are and how they operate. An explanation of the operation of the extinguishers is included in the manufacturer's manual and should be reviewed by the plant's staff. There should be an evacuation plan and map indicating where all emergency equipment (e.g., fire extinguishers, first aid kits, fire blankets, eye washers/showers) is located. All personnel shall be trained in emergency procedures and evacuations should be rehearsed. The route to the nearest

hospital will be posted at the plant and in the site safety plan. Plant personnel should become familiar wit this hospital route.

Personnel should be aware of the fact that safety in the operations and maintenance of the facilities falls within OSHA regulations (Construction Safety Standards, 20 CFR 1926, and General Industry Safety and Health Standards, 29 CFP 1910). They should, therefore, become familiar with this act and keep up-to-date on its revisions and interpretations.

7.2 SAFETY PLANS REQUIRED IN EMERGENCIES

Effective response in emergencies requires prior planning, preparation, and training. Many of the potential accidents and emergencies that can occur at this facility are addressed in the OHM Safety, Health, and Emergency Response Plan, Spill Control Plan and this O&M Plan.

7.3 CONFINED SPACE ENTRY PROCEDURE

A confined space is defined as a space that has limited entry and exit, is not designed for continuous occupancy (not for you to live in), and does not have adequate ventilation to prevent the buildup of a hazardous atmosphere. Examples of confined spaces at the site include the extraction well vaults, recycle wetwell, all chemical and process tanks, and the effluent monitoring manhole. Entry to these structures is not required for normal day to day activities.

As groundwater is collected and treated, chemical changes take place, releasing or increasing the concentration of toxic and combustible gases. Even when these gases are not present in concentrations high enough to cause physical harm, the reactions utilize the oxygen in the atmosphere. Using correct entry procedures will avoid most hazardous situations, but the environment is constantly changing; therefore, it must be treated as dangerous. The following are five of the potential hazards of confined space entry, although there could be many more:

7.3.1 Oxygen Deficiency

Oxygen deficiency is a primary concern in confined space entry. An oxygen deficient environment is one that falls below 19.5% oxygen, normal air is 21% oxygen. Over 50% of the deaths due to confined space entry are because of

oxygen deficiency. The great danger in this environment is that the effects cause no discomfort. In fact, you'll feel lightheaded with a false sense of well-being. OSHA has determined that you can safely stay in an atmosphere of 16% O_2 for eight hours;

- at 14%, a person would start coughing and have difficulty breathing;
- at 12%, thinking becomes unclear and drowsiness sets in;
- at 10%, you will rapidly become unconscious; and
- at 8%, you would die in a few minutes.

7.3.2 Toxic Gases

Toxic gases replace the oxygen in your blood and literally pump poison through your body. Depending on the level of exposure, the effects may be acute (short-term) or chronic (long-term). The two most common toxic gases will be presented: hydrogen sulfide (H_2S) and carbon monoxide (CO).

Hydrogen Sulfide

Hydrogen sulfide is deadly but so common that it is often ignored until it is too late. H_2S is heavier than air; therefore, it will be found at the bottom of the confined space. It smells like rotten eggs, even at low concentrations. If the smell is absent, it does not mean there is no hydrogen sulfide gas present. H_2S impairs your sense of smell and actually deadens the olfactory glands in your nose. Hydrogen sulfide at a level of 0.01% of the atmosphere will deaden your sense of smell after fifteen minutes of exposure and you will start coughing at this concentration. At 0.02% you lose your sense of smell immediately and will have increased trouble breathing. When the concentration reaches 0.07% to 0.1%, a person will have acute poisoning, become unconscious, and the respiratory system will be paralyzed and breathing will stop. At an exposure of 0.2%, death will occur in a few minutes. Often, a victim is overcome by hydrogen sulfide, becomes unconscious and the cause of death is drowning. Special notice should be taken that repeated low level exposures of 0.001% to 0.002% H_2S may increase your susceptibility to eye, nose and throat irritation.

H_2S may be detected with permanent and portable detectors. These should be used before entering any confined space or suspicious area.

Carbon Monoxide

Carbon monoxide is a colorless and odorless gas that will be found near the top of the confined space. CO is a product of combustion (e.g., propane, car exhaust, etc.) and is apt to be introduced into the collection system through faulty exhaust systems on equipment. As obvious as it seems, you must be careful not to draw exhaust fumes into a confined space. For example, when working in a manhole, park your vehicle with the exhaust downwind of the manhole. Low concentrations of 0.01% CO for two hours can cause headaches, dizziness and poor concentration. Increased concentrations of 0.05% to 0.1% can cause severe headaches, mental confusion and even brain damage. You will become unconscious after thirty minutes of exposure at levels of 0.2% to 0.25%, and at 0.4%, you will die in approximately four hours.

7.3.3 Combustible Gases

Combustible gases can be produced in the treatment system or introduced through spills. In order for an explosion to occur, there must be the correct mixture of gas and air and a source of ignition. Combustible gases have a lower explosive limit (LEL) and an upper explosive limit (UEL). For example, methane (CH_4), a common gas produced by anaerobic digestion, has an LEL of 5% and an UEL of 15%. When the atmosphere reaches 5% CH_4, it can explode, and when it reaches 15%, it will be too "rich" to explode. If the atmosphere is above 15%, it does not mean it is safe to enter, for your body will displace some of the atmosphere and change the air/gas ratio. IF COMBUSTIBLE GASES ARE PRESENT, DO NOT ENTER THE CONFINED SPACE! Methane is a highly flammable, colorless and odorless gas that is lighter than air; therefore, it is found near the top of the confined space. This is why non-sparking tools should be used to open covers.

Gasoline is another common gas found in wastewater. It is extremely volatile. The LEL is 1.3%. It is heavier than air and is apt to be found trapped in the grit in the bottom of a space.

7.3.4 Slipping and Falling

Slipping and falling is the second most common cause of injuries and is definitely a potential hazard in confined space entry. Always check the rungs before climbing in and, if they are questionable, use a ladder. Most confined spaces are in moist atmospheres which create slippery conditions. When

working on equipment in a confined space, lower the tools in a bucket or in some other safe way. Do not carry tools in your hands and descend the ladder using only one hand.

7.3.5 Traffic

Traffic may be a concern when working on the collection system and extraction wells. Place warning signs well ahead of the job site and allow your crew plenty of room to work.

7.3.6 Equipment Required for Confined Space Entry

Harness

A full body style is required, along with a sturdy rope and hook. It must always be worn. Inspect it regularly for condition and store in an accessible location.

Ventilator

A gasoline or electric portable blower. ALWAYS BLOW AIR IN. Place intake away from exhausts. Maintain as any small engine or motor and inspect hose regularly.

Air Monitoring Equipment

A meter must be capable of testing the atmosphere for all three conditions: Oxygen deficiency, toxic gases and combustible gases. Normal air is 21 percent oxygen, 78 percent nitrogen and 1 percent of trace gases. An atmosphere that was normal but contained 0.2 percent hydrogen sulfide would test safe for oxygen and combustion (H_2S explodes at 4.3 percent), yet it would kill you. TEST FOR TOXICITY. Lower the meter to the bottom of the space, test for five minutes, slowly raise to the top, stopping at incoming lines or crevices. Continuous monitoring is required while in the space. Calibrate monthly and keep in charger when not in use. The oxygen cell will need to be replaced yearly. If it is frozen, it will be permanently damaged.

Self-Contained Breathing Apparatus (SCBA)

An SCBA must be a positive pressure unit and immediately available outside of space. Refer to Table 7.1 for maintenance. SCBAs are for emergency use. If correct entry procedures are used, use of SCBAs will be avoided.

A confined space entry procedure is presented in Table 7.2 Improperly entering a confined space is one of the biggest killers in the field. In conclusion, there are two points that need to be addressed:

(1) Don't be a dead hero. Rescuer deaths outnumber first victim deaths; and

(2) Presently, all confined spaces, extraction well vaults to manholes, are dealt with in the same manner.

Tripod

Use a tripod when you only have two people available. Remember: "Two people up for every person down." Inspect cable regularly. Do not use the tripod for lifting/lowering equipment.

TABLE 7.1

SCBA MONTHLY INSPECTION

- Completeness. Make sure all the required components are available.
- Cylinder Pressure. This should be fully charged. Check the date of the hydrostatic test annually.
- Condition Check. Examine entire unit, pull rubber parts to check for cracks or breaks, and check for scratches or any breakage.
- Cleaning and Disinfecting. The entire unit should be cleaned with a damp sponge, the face piece should be disinfected with a warm cleaner disinfectant or a detergent solution, then air-dried and reassembled.
- Leak Check. Turn on cylinder valve. With soapy water, check all hoses and valves for leaks. To check breathing system, hold face piece against face, hold breath, shut cylinder valve and observe gauge. Decrease in pressure indicates leakage.
- Operational Check. Put on unit and operate in a normal manner. Make sure alarm works.
- Correct Any Problems Immediately!!
- Fill tanks immediately after using.
- Store with valves closed and pressure released from regulator.
- OSHA requires personnel who use SCBA to be properly trained and to undergo annual fitness tests.

Confined Space is defined as any enclosed or semi-enclosed space with limited openings for entry and exit. It is not intended for continuous employee occupancy without sufficient ventilation to prevent the build-up of hazardous atmosphere.

TABLE 7.2

A GUIDE TO CONFINED SPACE ENTRY

Confined Space Entry Procedures

1. Notify the Superintendent of details. Call at least one additional person. A total of three people is recommended and two are a minimum.

2. The person entering space must wear a safety harness with an appropriately long rope.

3. With only two people, use a man-rated hoist at all times. One person cannot lift another.

4. An SCBA must be available immediately outside the confined space.

5. Test for oxygen deficiency, toxicity and combustible gas conditions.

6. Ventilate space for 15 minutes prior to entering. ALWAYS BLOW AIR IN.

7. Continuously re-test for oxygen deficiency, toxicity and combustible gas conditions.

8. If air quality proves dangerous, you must:

a. Maintain ventilation to provide safe air quality conditions while working.
b. If proper safe levels cannot be maintained, no one should be allowed in the confined space without an SCBA. If combustible gas levels cannot be met, no one should be allowed in the confined space, even with an SCBA.
c. If safe levels are maintained, continue using air monitoring equipment as long as anyone is still within the confined space.

9. Prior to entering and while working within a confined space that may be susceptible to combustible gases, use non-sparking tools only.

10. Upon completion of work, notify the Superintendent that the job was safely completed.

11. Develop a permit system for all confined space entry. OSHA is expected to require a permit system in the near future.

7.3.7 Confined Space Entry Rescue Plan

In the event of an emergency requiring the rescue of one or more people engaged in a confined space entry, the procedures outlined in this plan will be followed.

Pre-entry Planning

Prior to entering a confined space, preparations have to be made for a potential rescue should it become necessary. Rescue equipment needed must be at the location of the confined space and read to use. Necessary equipment includes

- Retrieval system
- Life line
  Harness
- Protective clothing and equipment
- Communications Equipment
- Appropriate first aid supplies

Rescue Procedures

A trained stand-by person (attendant) will be assigned to each confined space with a fully charged SCBA, Airline or appropriate respirator. The stand-by is to keep all lines clear, to maintain contact with all workers within the confined space and to summon help if needed. The stand-by must never enter the confined space unless relieved by rescue assistance. The stand-by may attempt a non-entry rescue by lifeline while waiting for rescue assistance.

It the confined space entry attendant determines that rescue of the entrants is necessary, the following procedure will be used.

- All work activities in and around the confined space will shut down.

- The confined space attendant will notify the site supervisor by radio or other means of communications that a rescue response is necessary.

- The supervisor will notify the off-site rescue services to respond to the site.

- The attendant will first attempt to rescue the entrants by use of the retrieval system.

- If retrieval by the attendant from the outside the space is unsuccessful, the entrant must wait for backup assistance before entering the confined space to attempt a rescue.

- The attendant will brief all on-site/off-site rescue services of the current conditions and hazards before rescue is attempted. Air monitoring data (LEL, O_2 and toxic gas) will be updated.

- No attempt will be made to proceed with the rescue if for any reason this would jeopardize the safety of any rescue personnel or exacerbate the problem. All hazards will be abated (i.e. ventilation of space to remove flammable levels of gases) before rescue is attempted.

- When all hazards to rescue personnel have been controlled and the necessary rescue equipment is available, proceed with the rescue.

- If an injures entrant is exposed to a hazardous substance, a material safety data sheet will be made available to the medical facility treating the exposed entrant.

All personnel authorized to perform rescue services will receive the following training:

Each member of the rescue service will be trained to use properly the personal protective equipment and rescue equipment.

Each member of the rescue service will be trained to perform the assigned rescue duties and know the hazards that may be faced during entry and rescue.

Each member of the rescue service will practice making confined space rescues before an actual emergency situation arises.

Each member of the rescue service will be trained in First-Aid and CPR. At least one currently certified member shall be available on-site.

7.4 LOCK OUT-TAG OUT PROCEDURES

This procedure establishes the minimum requirements for the lockout or tagout of energy isolating devices. It shall be used to ensure that machine, system or equipment are isolated from all potentially hazardous energy, and locked out or tagged out before performing any service or maintenance activities where the unexpected energizing, start-up or release of stored energy could cause injury.

It is important to understand that failure to adhere to basic safety procedures could result in serious personal injury or death.

7.4.1 Lockout System

The lockout system will be used if an energy isolating devise is capable of being locked out. When you are blocking the flow of energy from the power source to the equipment, ensure that the energy isolating devise and the equipment being controlled cannot be operated until the lockout devise is removed. A lockout devise is usually a key or combination lock arrangement that secures the energizing of a machine or equipment.

7.4.2 Tagout System

The tagout system will be used if an energy isolating devise is not capable of being locked out. Attach a tag on a power source to warn others not to restore energy to the piece of equipment. Tags should be treated like locks. They are not to be removed without authorization; tags are never to be bypassed or ignored.

7.4.3 Lockout/Tagout Devices

- Singularly identified, shall be the only devices used for controlling energy; shall not be used for other purposes.
- Durable and capable of withstanding the environment and time they will be exposed
- Strong enough to prevent inadvertent or accidental removal
- identify the person applying the device

7.4.4 Procedure

1. Notify all effected people when this is to be done. Turn off equipment/system and disconnect the energy source.

   Shut the machine down by the normal stopping procedure (putt the plug, flip the power switch, break the circuit, pull the fuse, close the valve or otherwise neutralize the stored energy). Do whatever is necessary to turn off the equipment and disconnect the energy source. Then test the "on" switch and turn it back to "off".

2. Lock out the energy sources. Use a padlock to lock the control lever or the multiple-lock adapter.

3. If you are using a lock, place a tag at the disconnect point.

   This shall be a "Danger- Do Not Operate" tag. On this tag write the name or number of the equipment, date and any pertinent information. Then sigh the tag and attach to the piece of the equipment. When it is physically impossible to use a lock, a tag is absolutely essential.

4. Release the residual energy. Zero energy means that the machine has been put in a state in which the possibility of an unexpected mechanical movement has been put to a minimum.

   You must remember that some equipment does not run by electricity alone. Releasing residual energy by discharging capacitors, grounding circuits or releasing built-up pressures is a step that cannot be overlooked.

   If need be, wear any required personal protective equipment for chemicals and vapors that may be present.

5. To restore energy safely, check to make sure all tools have been removed, all lines have been reconnected or unblocked, guards have been replaced and other people are safely out of the way.

   In normal circumstances, "Danger- Do Not Operate" tags and locks can be removed only be the person who signed the tag originally. The lock and tag are to be removed as soon as the equipment/system is ready to be returned to normal service.

This procedure is designed to provide some basic and consistent steps to follow when it is necessary to protect personnel working on or operating defective equipment. In order to ensure that all people are adequately protected while working, follow the outline presented here; and think through each individual situation and understand all potential safety implications.

7.5 CHEMICAL HANDLING

If properly done, chemical handling can be simple and safe.. Five process chemicals used at the facility require special safety precautions because of their large volumes. These are caustic soda, sulfuric acid, hydrogen peroxide, potassium permanganate and flocculant polymer. In addition to these, there are small quantities of chemicals used for laboratory tests.

Each chemical brought on-site must be supplied with an Material Safety Data Sheet (MSDS) from the manufacturer. These will be kept in a notebook and regularly updated. OSHA requires all personnel at the facility know where the MSDSs are kept. All handling of chemicals will be in compliance with NAS Brunswick Facility Response Plan, SPCC Plan, Hazardous Waste Contingency Plan, and Stormwater Pollution Protection Plan.

7.5.1 Caustic Soda

Caustic Soda, caustic and lye are common terms for sodium hydroxide (NaOH). The caustic, used for pH adjustment, is stored in a bulk tank.

It is highly corrosive and attacks eyes, skin and other materials. On your skin, lye feels slippery because it reacts with fats and oils.

Care must be taken in handling caustic.

- Keep records of your caustic inventory to ensure adequate supplies for pH adjustment.
- Make sure that warning signs are clearly on the bulk tanks.
- Always wear alkaline-proof gloves (heavy rubber), a rubber apron and goggles when working with caustic.
- Always purchase the chemical from a reputable supplier.

- Check the caustic feed pumps and piping daily to ensure that there are no leaks. Repair leaks immediately.

7.5.2 Sulfuric Acid

Sulfuric acid, used in the odor control process, is purchased in 55-gallon drums at 98% concentration. It is a highly corrosive chemical that attacks eyes, skin, metals and other materials. Care must be taken in handling sulfuric acid.

- Keep records of your acid inventory to ensure that enough is on hand for treatment.
- Make sure that warning signs are clearly visible.
- Always wear acid-proof rubber gloves, a rubber apron and goggles when working with sulfuric acid.
- Always purchase acid from a reputable supplier.
- Have enough people available to move the drums. Each drum weighs over 500 pounds and must be moved carefully.
- The acid is used in the treatment process at full strength and does not require dilution. If a diluted acid is needed for some laboratory test, add the acid to water ("a" to "w"). NEVER ADD WATER TO ACID. The violent reaction produces enough heat to boil and splatter the acid back onto the operator.
- Check the acid feed pumps and pipe daily to ensure that there are no leaks. Repair leaks immediately.
- Store acid drums in contained areas.

7.5.3 Anionic Flocculant Polymer

Anionic polymer is used in the clarifier to enhance solids settling and in the sludge day tank for sludge conditioning prior to pressing. Safety guidelines will vary with the product that is used. As a consequence, you must refer to the manufacturer's data for safe handling of the polymer. Some general guidelines for polymers are listed below.

- Polymers tend to be extremely slippery when wet. All spills should be thoroughly cleaned after first absorbing excess polymer with vermiculite, paper or some other absorbent material.

- Many polymers can ignite explosively - NEVER weld or use a cutting torch on or near a drum. Even residues can ignite.

- Wear protective clothing and goggles when handling polymers because many are strong irritants. Wash any polymer from your skin thoroughly.

- Many polymers release toxic gases when on fire and require wearing a self-contained breathing apparatus.

7.5.4 Hydrogen Peroxide

Hydrogen Peroxide is purchased in bulk and is used as an oxidizing agent with the ultraviolet oxidation system. The 50 % Hydrogen peroxide can cause extreme irritation of the eyes, nose and throat. Eye contact can cause severe damage or blindness. Skin exposure results in tingling and temporary whitness. If washed, skin should return to normal a few hours. With no treatment, redness and blister formation may result

- Keep records of inventory to ensure that enough is on hand for treatment.

- Make sure that warning signs are clearly visible.

- Always wear rubber gloves, a rubber apron and goggles when working with hydrogen peroxide.

- Always purchase from a reputable supplier.

- Check the feed pumps and pipe daily to ensure that there are no leaks. Repair leaks immediately.

- If spilled, wash down with copious amounts of water.

- Hydrogen peroxide decomposes slowly at ordinary temperatures and builds up pressure in closed containers.

- Hydrogen peroxide will attack some forms of plastics, rubbers and coatings; and although it is not flammable, it will support combustion as it is a powerful oxidizing agent.

7.5.5 Potassium Permanganate

Potassium permanganate is purchased in dry form in drums and is used as an oxidizing agent to aid in the flocculation of metals in the clarifier and as a regenerating agent in the green sand filters. It can cause extreme irritation of the eyes, nose and throat. Eye contact can cause severe damage or blindness. Prolong contact of solution with the skin may be irritating and leave brown staining. Concentrated solutions at elevated temperature and crystals are corrosive to the skin.

- Keep records of inventory to ensure that enough is on hand for treatment.
- Make sure that warning signs are clearly visible.
- Always wear rubber gloves, a rubber apron and goggles when working with Potassium permanganate.
- Always purchase from a reputable supplier.
- Check the feed pumps and pipe daily to ensure that there are no leaks. Repair leaks immediately.
- If spilled, sweep up but do not return to the original container.
- Potassium permanganate is not flammable, but it will support combustion as it is a powerful oxidizing agent.

7.6 FALL PROTECTION PLAN

7.6.1 Objective

Personal can be protected from fall hazards, such as unprotected edges 6 feet or more above the next lower level, by learning to recognize fall hazards and implement the proper controls, including the appropriate selection, sue, and maintenance of fall protection equipment. Note: OSHA regulation requires fall protection at a height of 6 feet; however, this procedure will evaluate fall hazards at 4 feet and implement the necessary control measures.

7.6.2 Purpose

The purpose of this procedure is to address the elements of the Fall Protection Program and to conform to the requirements found in 29 CFR 1926 Subpart M - Fall Protection.

7.6.3. DEFINITIONS

The following are common definitions used to describe fall protection systems.

Anchorage/Tie-Off Point

A secure point of attachment for lifelines, lanyards, or deceleration devices; must have 5,000 pounds tensile strength per employee. (Examples - eye bolts, beams)

Body Belt

A strap that can be both secured around the waist and attached to a lanyard, lifeline, or deceleration device. Body belts must never be used in a fall arrest system.

Body harness

Straps that can be secured around the employee to distribute the fall arrest forces over the thighs, pelvis, waist, chest, and shoulders with a dee-ring in the middle of the back to attach it to other components of a personal fall arrest system.

Deceleration Device

Mechanism such as a rope grab or a self-retracting lifeline or shock absorbing lanyard that serves to dissipate a large amount of energy during a fall arrest.

Guardrail System

A barrier erected as an engineering control to prevent employees from falling to a lower level.

Lanyard

Flexible line of rope, wire rope, or strap with a connector at each end to connect a body belt or harness to a deceleration device, lifeline, or anchorage. Lanyards

must have double-locking snaphooks, 5,000 pound tensile strength and are limited to 6 feet in length.

Leading Edge

Edge of a floor, roof, or framework that changes location as additional material is formed/constructed. The edge is considered an unprotected or leading side/edge when not actively and continuously under construction. The wall of bank of an excavation can be considered a leading edge.

Low Sloped Roof

A roof having a slope less than or equal to 4:12 (vertical to horizontal).

Personal Fall Arrest System

A system used to arrest an employee in a fall from a working level. A complete system consists of anchorage, connectors, body harness, and may include a lanyard, deceleration device, lifeline, or combination. The use of body belts for fall arrest is prohibited.

Portable Anchorage Point

An attachment strap used to connect the lanyard to an anchorage member when there is no eye bolt or other means for direct attachment; must have 5,000 pound tensile strength.

Positioning Device System

A body belt of harness used to support an employee on an elevated surface with both hands free and/or prevent an employee from approaching a leading edge. A positioning device must not be used in a fall arrest system.

Roll Out

The accidental disengagement or opening of a snaphook, which occurs where there is an improper use of a snaphook with an attachment point. The force of the fall arrest rebounds through the lanyard, the hook is driven up and around the attachment, the gate is depressed, allowing the snaphook to open or roll out. This can be prevented by using double-locking snaphooks.

Roof

The exterior surface on the top of a building not including floors or framework serving as the temporary top surface while building construction is being completed.

Rope Grab

A deceleration device that travels on a lifeline and automatically engages the lifeline and locks to arrest the employee's fall. Operates by friction and employs the principle of inertial locking and/or cam/level locking.

Swing Fall

A pendulum-type swing resulting from a fall. A large swing arc is produced from lateral movement away from the anchorage point, momentum builds and the victim usually strikes an obstruction or sharp object, which stops the swing/fall. Swing fall hazards can be controlled by maintaining an anchorage point, which at a minimum is at or above the employee's shoulders.

Warning Line System

A barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area where roofing work may take place without the use of a guardrail, safety net, or fall arrest system to protect employees in the area.

7.6.4 HAZARD RECOGNITION

Fall hazards and falling object hazards may be encountered by personnel in the following situations:

- Working on levels 6 feet or more above the next lower level/ground with an open side. Common situations might include work on top of frac tanks, carbon cells, pipe racks, open floors, excavation, and pits.

- Falling object/overhead hazards such as those encountered during work in an excavation, during tank cleaning operations, or working below scaffolds.

- Improper selection and use of fall protection equipment can lead to serious accidents or even fatalities resulting form swing falls or failure of fall arrest components.

- Trips, falls, or tangles in fall protection equipment.

Other industry standards that involve fall hazards are 29 CFR 1926 Subpart L, the Scaffolding standard, Subpart X, Floor and Wall Openings and Stairways and Ladders.

7.6.5. GUARDRAIL SYSTEMS

Guardrail systems should be used as an engineering control to eliminate hazards of unprotected edges or open holes. Note: OSHA prefers the use of engineering controls over personal protective equipment for controlling hazards at work.

System Specifications

- Height of the top rail edge must be 42 inches ±3 inches above the working level.
- Midrails shall be installed midway between the top rail and working level.
- Guardrail system must be capable of withstanding 200 pounds of force applied outward or downward within 2 inches of the top edge of the guardrail at any point. (Midrails must have 150 pound capacity.)
- Guardrail system shall be constructed to prevent puncture or laceration to personnel or equipment, or snagging of clothing.
- Top rails and midrails shall be at least one-quarter of an inch-thick to prevent cuts/lacerations. If wire rope is used, it must be flagged every 6 inches. Metal strapping and rope are not acceptable for use.
- Toeboards should be installed whenever personnel are working above other personnel to prevent tools or debris from being kicked out, falling, and striking the people below.

System Use

- Personnel should not lean on guardrails or rest equipment against guardrails.
- Inspect guardrails regularly for defects, and replace/rebuild defective components immediately.

7.6.6 COVERS

Holes (including skylights) in walking/working surfaces that present a potential for employees to fall 6 feet or more must be protected using guardrails, personal fall arrest systems, or covers. Holes that could permit objects to fall and strike personnel below must also be protected with covers.

- Covers shall be capable of supporting at least twice the maximum axle load of the largest vehicle expected to drive over the cover.
- Covers shall be capable of supporting at least twice the weight of employees expected to walk over the cover.
- Covers shall be secured to prevent displacement by wind, equipment, or employees.
- Covers shall be marked with signs or other hazard warnings such as "Do not remove - open hole."

7.6.7 PERSONAL FALL ARREST SYSTEMS

These systems should be used when engineering controls are not feasible to control a fall hazard of (47) 6 feet.

System Specifications

- Components of a personal fall arrest system include a body system (harness), connecting device (rope or web lanyard, shock absorbing lanyard, self-retracting lifeline), and a tie-off or anchorage point (5,000 pounds per worker, eye bolt, or beam).
- The sue of body belts and lanyards with non-locking snaphooks is not acceptable for a fall arrest system.
- Dee-rings, snap hooks, and attachment straps must have 5,000 pound tensile strength.

System Use

- Use a portable anchorage point (strap) to connect the lanyard to the anchorage point when there is no eye bolt for direct attachment. Hitching the lanyard onto itself as a choker is <u>never</u> allowed.

- Attach connecting devices to the dee-ring in the middle of the back.

- Locate anchorage points at or above the dee-ring attachment point in the middle of the back.

- Choose an anchor point that is located well above the lower level. A 6-foot man, with a 6-foot lanyard, plus 3.5 foot maximum shock absorbing extension requires a maximum fall distance of 15.5 feet from the anchor point to avoid striking the ground/lower level.

- Do not tie off around sharp edges, which may cut anchorage straps and lanyards.

- Discard all components of a fall arrest system (e.g. harness, lanyard) after a fall, and replace them with new fall arrest equipment.

- Maintain fall arrest systems that are free of debris, rust, and corrosion; protect them from crushing and sharp surfaces. Appropriately clean and dry components before storing them in a safe place.

- Dispose of chemically contaminated components properly at the conclusion of a project or when the chemical could have an adverse effect on the device.

Inspecting Components

Inspect systems using the following guidelines:

Harnesses and Dee-Rings

- Hold with two hands, bend, and look for broken fibers, cuts, and pulled stitches.
- Dee-rings should pivot freely. Inspect for distortion, cracks, and breaks.
- Inspect for wear, frayed or cut fibers, or distortion of buckles. Rivets must be tight and immovable with the fingers. Bent rivets may fail under stress.
- Inspect for frayed or broken strands. Look for tufts on webbing surface.
- Inspect for wear of repeated buckling and unbuckling on the tongue or billet. Look for loose, distorted grommets. There should be no additional punched holes.

Lanyards

- Inspect for frays by twisting the rope.

- Inspect for failing hook latches, absence of locking latches, or a change in shape of the metal eye on lanyards or hooks.
- Examine for rips or tears in shock absorbing lanyard sections.
- Self-retracting lifelines must be inspected annually by the manufacturer.

7.6.8 WARNING LINE SYSTEMS

Warning line systems are often combined with other fall protection systems to provide fall protection for work on low-sloped roofs. Personnel working on low-sloped roofs with unprotected sides (4 or) 6 feet or more above the next lower level must implement fall protection to include one of the following:

- Warning line and guardrail system,
- Warning line and safety net system,
- Warning line and personal fall arrest system,
- Warning line and safety monitoring system, or
- Guardrail, safety net, or personal fall arrest system.

NOTE: The warning line system alone is acceptable fall protection for low-sloped roofs 50 feet or less in width.

System Specifications

- Warning lines consist of ropes, wires or chains, and supporting stanchions.

- Flag warning lines every 6 feet with ;high visibility materiel.

- With the warning line erected, stanchions shall be capable of resisting at least 16 pounds applied horizontally, perpendicular to the warning line, without tipping over.

- The lowest point (sag) of the lines must be at least 34 inches from the work surface and no more than 39 inches from the work surface.

- The warning line shall have a minimum tensile strength of 500 pounds.

System Use

- Erect warning lines around all sides of the roof work area.

- Erect warning lines at least 6 feet from the roof edge when mechanical equipment is not being used.

- When mechanical equipment is in use, erect warning lines at least 6 feet from the edge parallel to equipment operations, and at least 10 feet from the edge that is perpendicular to equipment operations.

- No employee is allowed in an ear between a roof edge and a warning line unless performing designated work tasks in that area.

- Mechanical equipment can be used and stored only in areas where employees are protected by a warning line, guardrail, or personal fall arrest system.

- Access points, storage, and hoist areas shall be connected to the work area by a path formed with two warning lines. When this path is not in use, it shall be barricaded with rope, wire, or chain, equivalent in strength and height to the warning line, to prevent employees from walking directly into the work area.

7.6.9 OVERHEAD PROTECTION

Employees are required to wear hardhats in areas where falling object hazards exist, and to implement one of the following:

- Erect toeboards, screens or a guardrail system to prevent objects from falling from the work surface.

- Erect a canopy structure and keep objects away from the edge of the work surface.

- Barricade areas where objects could fall, keep employees out of barricaded areas and keep objects away from the edge of the work surface.

7.6.10 OTHER FALL PROTECTION SYSTEMS

A number of other fall protection systems can be used, including safety nets, safety monitoring systems, controlled access zones, or a combination of these. These systems are less likely to be used on projects due to the nature of the work and the selection of guardrails, covers, and personal fall arrest systems to better provide fall protection.

8.0 EQUIPMENT MAINTENANCE

8.1 GENERAL MAINTENANCE REQUIREMENTS

An efficient and well-run treatment facility must incorporate a comprehensive preventive and corrective maintenance program. A routine preventive maintenance program involves inspection and lubrication. A system of record keeping will help maintain treatment requirements and keep equipment repairs to a minimum. When the new facilities are placed into operation, a sound preventive maintenance program for the entire system should be implemented.

Preventive maintenance is the daily process of lubricating, inspecting, cleaning, and adjusting equipment with an eye toward preventing costly equipment failures. When equipment no longer functions as designed, corrective maintenance becomes necessary and system efficiency suffers.

The maintenance of any treatment facility depends totally on the competence and the attitude of the personnel who perform the work. Except for specialized and complex equipment, a thorough knowledge of the facilities equipment and maintenance systems by the staff will, over a period of years keep operating costs to a minimum.

In any maintenance system there are basic features applicable to the size and type of treatment plant, which include the following information;

- Equipment and record system;
- Planning and scheduling;
- Storeroom and inventory system;
- Maintenance personnel; and
- Cost and budget for maintenance operations.

8.2 EQUIPMENT RECORD SYSTEM

An efficient record system promotes adequate equipment maintenance. Record systems include descriptions of equipment, supplies, representatives' phone numbers, date of purchase, cost, size, model, serial number, electrical and mechanical data, inventory of spare parts, and a record of labor and material costs applied to the equipment. These records will be kept in a database in the control room.

The best maintenance system will not be effective if the staff is not thoroughly knowledgeable about the operation and function of the equipment in the

treatment facility. However, even the most qualified personnel cannot be expected to perform some specialized tasks; therefore, the use of consultants for these tasks is to be expected.

The basis for developing a maintenance budget, which will be included in the overall plant budget, should be obtained from the storeroom inventory data and the equipment maintenance records. From these records, and allowing for equipment replacement plant expansion and labor requirements, an accurate budget can be developed. An accurate budget must provide a breakdown between preventive and corrective maintenance and major repairs or alterations. Time spent on each maintenance item should be recorded and a log kept to develop approximate time estimates for future maintenance and budget information.

Any labor records and material costs not directly related to equipment O&M should be logged and recorded for budget development and planning.

8.3 SITE AND EQUIPMENT MAINTENANCE

The Operator should keep the plant in a good housekeeping condition, and to do what he can to beautify the surroundings. Keeping the grounds in a neat and orderly manner will greatly enhance the appearance of the facility.

Any spills of process chemicals or oil should be cleaned up by appropriately-trained personnel. Any spill cleanup effort will comply with NAS Brunswick Facilities Response Plan, SPCC Plan. Hazardous Waste Contingency Plan and Stormwater Pollution Protection Plan. The floors in the process areas should be swept and washed at least weekly.

Maintenance also includes a list of items covering the GWTP Building. This list should include roof, windows, door frames, and any exterior and interior metalwork. A roof inspection should be made yearly. If the roof requires a maintenance, it would be best to obtain the services of a competent local roofer. In addition, repainting the interior framework of the building should be scheduled regularly to keep cleaning and maintenance chores at a minimum. Paints compatible with the original paint system should be used to assure maximum life of the coating.

The orderly storage of tools, as well as having the proper tools for the job, will enable the staff to perform maintenance tasks more efficiently. All tools should be labeled with equipment numbers, maintained in good working order, and stored in the storeroom.

Lubrication is the most important area of preventive maintenance. Lubrication data obtained from equipment manufacturers should be recorded on the equipment record system as previously discussed and lubrication routes set up. An effort should be made by the staff to standardize application methods and investigate new lubricants. One method for simplifying the lubrication process is to color-code the equipment or part in need of lubrication. A tag is used to identify the frequency and type of lubricant needed; for example:

Color and Type	Frequency
Blue	Daily
White	Weekly
Green	Monthly
Red	Semiannually
Brown	Annually

Lubricants will be required for proper maintenance of the process pumps and other mechanical equipment. It is suggested that the Operator review lubrication requirements, as recommended by the equipment manufacturers, with representatives from several major lubricant suppliers (e.g., Texaco, Shell). These representatives should be able to submit competitive bids to the Operator for supplying the necessary lubricants. Petroleum and synthetic lubricants should be considered.

Most manufacturers warrant their products against defective workmanship and materials for a period of 1 year after the date of installation. If a piece of equipment fails during the warranty period, notify the manufacturer at once before performing any service. Unauthorized service could invalidate the warranty. The Operator should be familiar with the warranty certificates for each piece of equipment. Do not attempt service unless you are qualified to do so.

Many manufacturers have a maintenance contract service available wherein a trained service employee will on a prescribed schedule, check the equipment for proper operation, accuracy, wear factors, and so forth. Such periodic checking allows replacement of parts prior to a complete breakdown. Parts that would normally wear over a period of time are replaced by this technician who will anticipate such need from an experience factor. The Operator should become familiar with the maintenance requirements of the plant equipment and decide if the manufacturers' service contracts are needed. It is recommended that major service be left to trained manufacturer service representatives. All costs related to maintenance services provided by outside maintenance personnel should be included in the maintenance budget.

A complete understanding of pump construction and operation is essential to provide proper maintenance. Daily inspection of all pumping equipment will be made, giving special attention to the following items:

- Bearings of heat and noise;
- Motor operating speed;
- Control equipment - cleanliness and condition;
- Pump operation - vibration and noise; and
- Seals - leakage or noise.

8.4 REPLACEMENT SCHEDULE FOR EQUIPMENT AND INSTALLED COMPONENTS

Over several years of operation, pieces of equipment may fail and require replacement. After plant equipment has been selected, facility staff will review all equipment to establish expected service life and estimate a replacement schedule and budget.

Equipment usage and expected life can only be determined after the plant has been up and running and the operator gets first hand experience on how each individual piece of equipment is operated and what conditions it is subject to (i.e. line pressures, shock loads, vibrations, balance problems etc.). This replacement schedule will be included in the O&M Manual

TABLE 8-1

PREVENTIVE MAINTENANCE CARD

EQUIPMENT _____ LOCATION _____ I.D. # _____

MANUFACTURER _____ SUPPLIER _____

MAINTENANCE TASK REQUIRED: _____

REQUIRED FREQUENCY: _____

ITEMS NEEDED (Tools, grease, etc.) _____

DATE	INITIALS	REMARKS

EQUIPMENT CARD

TABLE 8-2

EQUIPMENT _____ LOCATION _____ I.D. # _____

MANUFACTURER _____ SUPPLIER _____

Address _____ Address _____

_____ _____

_____ _____

Phone _____ Phone _____

Contact _____ Contact _____

_____ _____

DATE PURCHASED _____ DATE PUT IN SERVICE _____

START-UP: AMPS __/__/__ VOLTS __/__/__ RPM _____

EQUIPMENT DATA:

Model # _____ Serial # _____ RPM _____ Size _____

Lubricant _____ Capacity _____ _____ _____

Other _____

MOTOR DATA:

Model # _____ Serial # _____ Frame _____ Style _____

Volts _____ AMP _____ Phase _____ Hp _____ RPM _____ HZ _____

Rating _____ Max. Amb _____ Insulation Class _____ Service Factor _____

Code Letter _____ NEMA Design _____ Heater Size _____ Bearings _____

NOTES:

REPAIR CARD

TABLE 8-3

EQUIPMENT _____ LOCATION _____ I.D. # _____

MANUFACTURER _____ SUPPLIER _____

DATE:	DATE:	DATE
INITIAL:	INITIAL:	INITIAL:
REPAIR COMPLETED:	REPAIR COMPLETED:	REPAIR COMPLETED:
COMMENTS:	COMMENTS:	COMMENTS:

INVENTORY CARD

TABLE 8-4

EQUIPMENT _____ LOCATION _____ I.D. # _____

MANUFACTURER _____ SUPPLIER _____

PHONE _____ PHONE _____

PARTS DESCRIPTION	ORDER #	QUANTITY NEEDED	QUANTITY IN STOCK

TABLE 8-5

EQUIPMENT LIST

EQUIPMENT NO. CODE DESCRIPTION WORK AREA: ____

CRIT FAC: ____

PARENT: _____ DRAWING NO.: _____

SERIAL NO.: _____ STATUS:

MODEL: _____ MANUFACTURER/ SUPPLIER: _____

DATES

MFG. LAST OH WARRANTY PURCHASE AVAIL. HOURS

USAGE

UNITS UOM DATE

WARRANTY USAGE COST CTR. EQUIPMENT LOCATION DEPRECIATION TERM

COMMENTS:

COST or VALUE:
ORG.: _____
RPL: _____
DEP: _____

9.0 RECORDS REPORTING AND MECHANISMS REQUIRED

A regular record-keeping and reporting mechanism should be established for the treatment facility. An efficient and comprehensive record system will provide an important historical record that documents the operation of the treatment plant. Such records may be used to identify trends in treatment performance, to budget for future O&M costs, for modifying O&M procedures, and to document compliance with treatment goals. Several categories of records and reporting mechanisms are described in the following subsections. As part of routine operation, treatment plant personnel should develop log sheets and reporting mechanisms for each of these categories, as well as any additional categories that are determined to be necessary. The goal of record keeping should be to make it possible for completely new operating staff to begin at the plant and be able to rely on records to know exactly what must be done on a regular basis as well as when various maintenance activities were last performed.

9.1 OPERATING LOGS

Operating logs should be prepared to record all O&M activities that are performed each day as well as the daily operation characteristics of the treatment plant performance such as flow rates, pressures, chemical feed rates, and levels in storage tanks. A daily operating log will help to ensure that all routine operating tasks are performed as necessary. The daily log should also record all unusual activities performed such as equipment problems, actions taken, and notifications to responsible owner personnel and regulatory authorities. All sampling documentation, including the time, date, and pump flow rates at the time of sampling, location of sample collection, description of the sample preservation, sample container identification number, and results of field testing, should also be recorded in the log.

The O&M log should include, at a minimum, the following information:

- Instantaneous and estimated average daily flow rate of the extraction wells;
- Treatment system downtime;
- Analytical results for influent and effluent samples;
- Daily maintenance and repairs made to equipment;
- All observations noted as unusual during facility inspections;
- Weekly quantity of sludge processed and dry sludge produced; and
- Documentation of sampling performed.

Documentation should occur in a bound log book. Forms should be filled out in indelible ink and signed by the Operator performing the O&M activities.

9 2 PERSONNEL AND MAINTENANCE RECORDS

Personnel and maintenance records should be kept to document when equipment maintenance and personnel training were last performed. Personnel records should also demonstrate Operator qualifications. The personnel records should be used to ensure that facility staff are properly trained and qualified. Equipment records should be used to track regular maintenance activities and identify future.

9.3 RECORDS FOR OPERATING COSTS

All costs associated with O&M of the treatment plant should be recorded. These records will be important for tracking O&M costs as well as for preparing budgets for future O&M. Costs should be as detailed as possible and clearly document the services performed.

9.4 MECHANISM FOR REPORTING EMERGENCIES

An accident reporting mechanism should be developed to document the details of any accidents that occur at the treatment plant. These reports may be used to review treatment plant safety and to modify operations as necessary to prevent similar accidents in the future. This is an important part of the general emergency response procedure as discussed in the Safety, Health, and Emergency Response Plan.

9.5 LABORATORY RECORDS

Records of laboratory analysis of samples collected at the treatment plant should be maintained and summarized on a regular basis. Summaries of laboratory results should be included in monthly and annual reports. Records of sampling should include information such as sample location, sample identification number, sample time, preservatives, sampler, and plant flow rates at the time of sampling. Laboratory results should be recorded in the daily log when they are received and summaries of results should be prepared for reports.

9.6 MONTHLY/ANNUAL REPORTS

Monthly and annual reports should be prepared to summarize treatment plant performance and any unusual operation and maintenance activities or modifications to treatment plant operations. Monthly and annual reports should be submitted to the Navy.

TABLE 9-1

Accident/Incident (Near Miss) Report

Employee's Name:_____ DOB_____
Address:_____ DOH_____
_____ SS #_____
Office Location:_____ Employee #_____
Location at Time of Incident:_____
Date/Time of Incident:_____

Describe clearly how the accident occurred (use back of page, if necessary):_____
_____
_____
_____

Was incident: Physical_____ Chemical_____
Parts of body affected: _____ Exposure: Dermal_____
right left Inhalation_____
Ingestion_____

Witnesses: 1)_____ 2)_____

Conditions/acts contributing to this incident_____
_____
_____

Managers must complete this section:

Explain specifically the corrective action you have taken to prevent a recurrence: (Use back of page, if necessary)
_____
_____

Did injured go to doctor:_____ Where:_____
_____ When:_____
Did injured go to hospital:_____ Where:_____
_____ When:_____
Was medical treatment required (see back page)_____

Signatures:

_____	_____	_____
Employee	Reporting Manager	Site Safety & Health Officer
_____	_____	_____
Date	Date	Date

Accidents must be reported immediately; this form must be completed and returned to the Site Safety and Health Officer within 24 hours of the incident or near miss. The Site Safety and Health Officer will then immediately forward a copy to the Training & Operations Group Safety and Health Manager.

Medical Treatment includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first-aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even through provided by a physician or registered professional personnel.

Comments:

10.0 ANNUAL OPERATIONS AND MAINTENANCE BUDGET

An annual operations and maintenance budget will be developed prior to the start of each year to account for and track yearly expenses. The estimated costs budgeted to run the Sites 1 & 3 Landfill and the Eastern Plume Groundwater Treatment Plant at Naval Air Station Brunswick are:

TABLE 10.1
ANNUAL OPERATIONS AND MAINTENANCE BUDGET

Budget Item	Estimated Annual Cost
Labor & fringe benefits	$ 64,041
Power & utilities	75,555
Chemicals & consumables	48,695
Repair and maintenance	5,280
Sludge disposal	5,302
Laboratory	5,700
Office expenses	2,475
Subcontractors	73,310
Miscellaneous expenses*	10,064
Admin & Tech support	37,541
Total Estimated Annual Operating Budget	**$ 327,963**

*Miscellaneous expenses include health & safety items, training, plant travel, technical support, travel, uniforms and administrative charges.

The annual budget is based on the expectations of expenses for the upcoming year, taking into account periodic maintenance items, chemical and supply usage's, and equipment replacement. Items not included are capitol cost items and potential retrofit cost due to unforeseen problems due to design or construction. These costs are based on the groundwater flows and contaminate levels as indicated in Section 2 of this plan.

APPENDIX

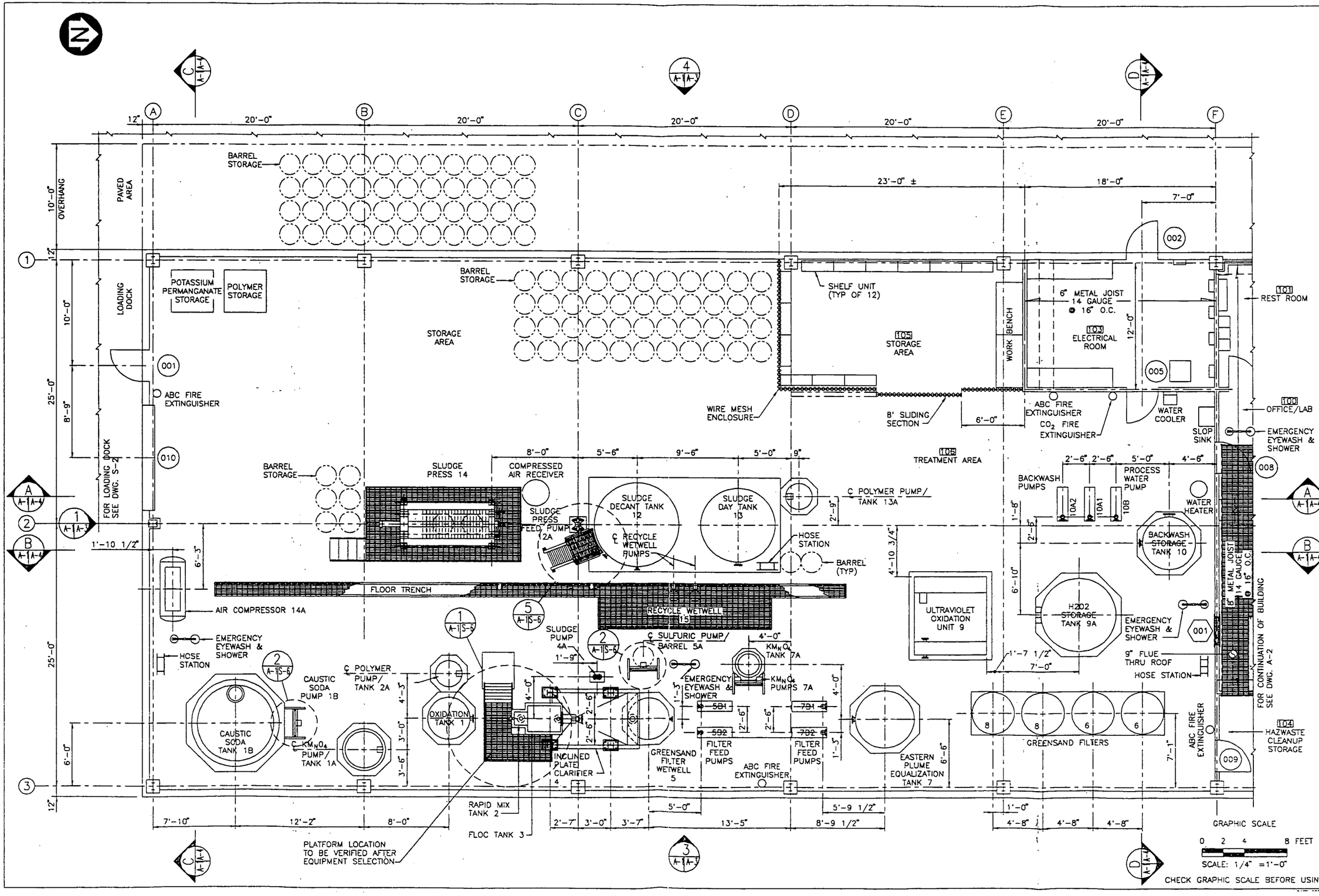


ABB Environmental Services, Inc. Portland ME

REV. | DESCRIPTION | PREP BY | DATE | APPRVD

NAVAL FACILITIES ENGINEERING COMMAND — PENNSYLVANIA

NORTHERN DIVISION — BRUNSWICK, MAINE

DEPARTMENT OF THE NAVY — NAVAL AIR STATION — LESTER

SEA AREA

SITES 1&3,5,6,8 AND EASTERN PLUME

GROUNDWATER TREATMENT BUILDING
CENTRAL AIRCRAFT MAINTENANCE AREA

SAT TO | DATE
SAT TO | DATE
CODE I.D. NO. 80091
SCALE: NOTED
SPEC. NO. 04-91-0034
CONSTRN. CONTR. NO. N62472-91-C-0034
NAVFAC DRAWING NO. 2160999
SHEET SHT# OF TSHT
SIZE: D | DWG. SH. NO. A-1

DOOR SCHEDULE					
DOOR NO.	TYPE (1)	GLAZING WxL (IN)	GLAZING THICKNESS (IN)	THRESHOLD MATERIAL	LOUVER SIZE WxL (IN)
001	FG	12x12	(2)	ALUM	–
002	FG	12x12	(2)	ALUM	–
003	FG	12x12	(2)	ALUM	–
004	FG	12x12	(2)	ALUM	–
005	FG	12x12	1/8	NONE	12x12
006	FL	–	–	NONE	10x6
007	FL	–	–	NONE	10x6
008	FGL	12x12	1/8	NONE	10x8
009	FGL	12x12	1/8	NONE	10x8

(1) F – FLUSH, G – GLAZED, L – LOUVERED

(2) INSULATED 2x3/16 INCH WITH 1/2 INCH AIR SPACE

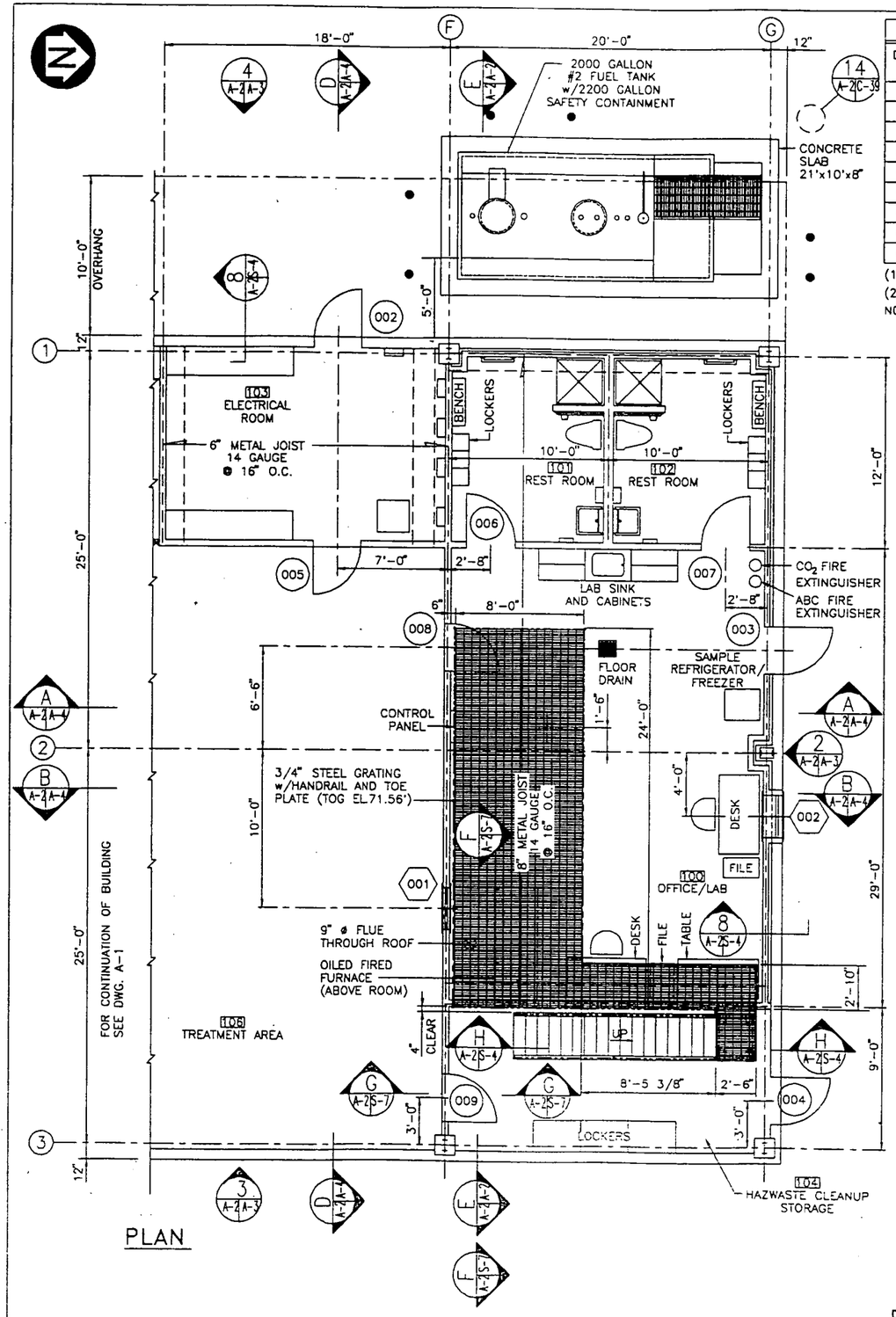
NOTE:
COMMON TO ALL DOORS – MATERIAL: STEEL; MODEL: 2 OR 4; SIZE: 3'x7'x1 3/4"

ROOM FINISH SCHEDULE								
NO.	NAME	FLOOR	BASE	WALL (EAST)	WALL (SOUTH)	WALL (WEST)	WALL (NORTH)	CEILING
100	OFFICE/LAB	VT (3)	VCB (4)	PTD (5)	PTD	PTD	PTD	PTD
101	REST ROOM	VT	VCB	PTD	PTD	PTD	PTD	PTD
102	REST ROOM	VT	VCB	PTD	PTD	PTD	PTD	PTD
103	ELECTRICAL ROOM	CONCRETE/HARDENER	VCB	PTD	PTD	PTD	PTD	NONE
104	HAZWASTE CLEANUP STORAGE	CONCRETE/HARDENER	VCB	PTD	PTD	PTD	PTD	NONE
105	STORAGE AREA	CONCRETE/HARDENER	VCB (NORTH WALL)	PTD	PTD	PTD	PTD	NONE
106	TREATMENT AREA	CONCRETE/HARDENER	VCB (NORTH WALL)	PTD	PTD	PTD	PTD	NONE

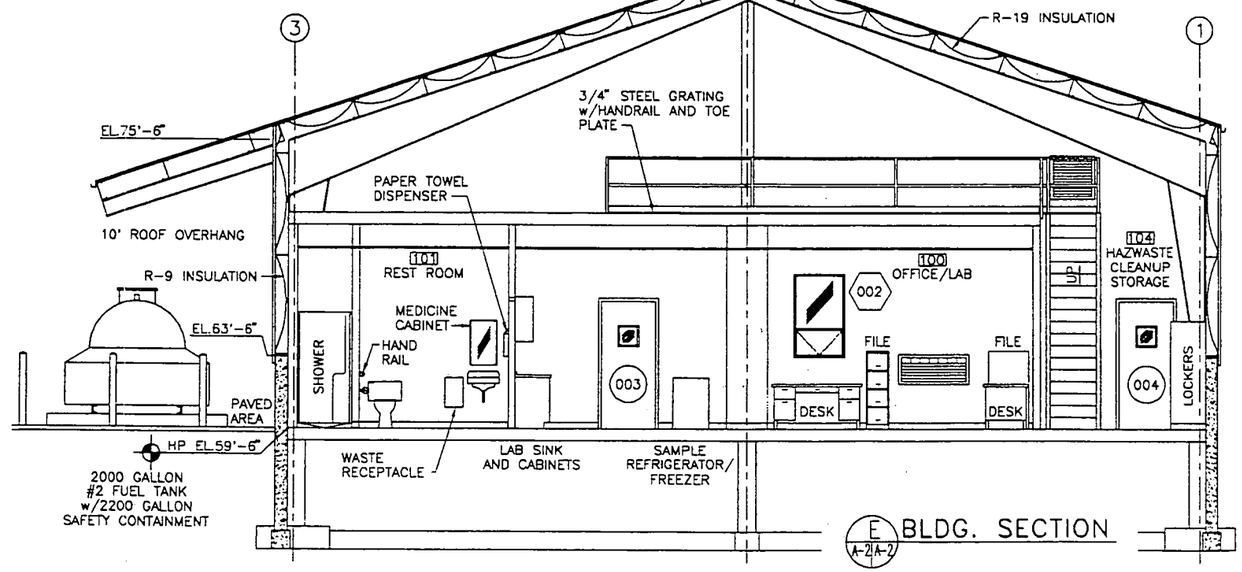
(3) VT – VINYL TILE

(4) VCB – VINYL COVE BASE

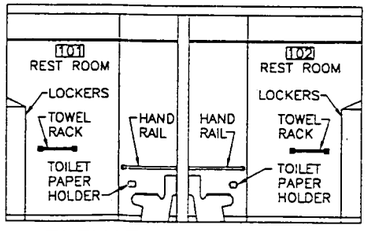
(5) PTD – PAINTED



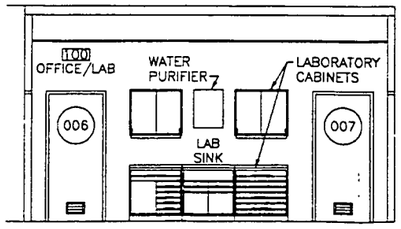
PLAN



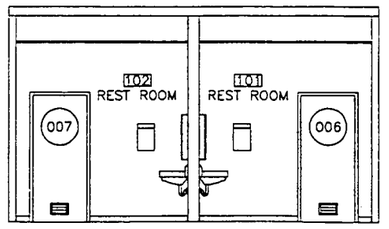
E BLDG. SECTION



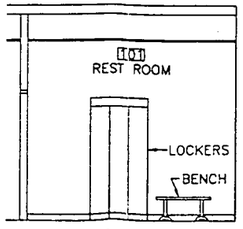
ELEVATION – WEST



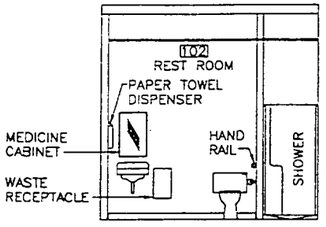
ELEVATION – WEST



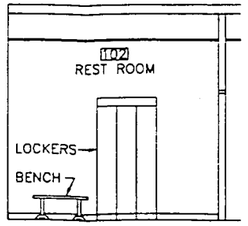
ELEVATION – EAST



ELEVATION – SOUTH



ELEVATION – SOUTH



ELEVATION – NORTH

GRAPHIC SCALE
0 2 4 8 FEET
SCALE: 1/4" = 1'-0"
CHECK GRAPHIC SCALE BEFORE USING

ABB Environmental Services, Inc. Portland ME

NORTHERN DIVISION

SITES 1&3,5,6,8 AND EASTERN PLUME

GRUNSWICK, MAINE

GENERAL ARRANGEMENT PLAN & SECTIONS

DEPARTMENT OF THE NAVY

LESTER NAVAL AIR STATION

CONTRACT NO. N62472-91-C-0034

NAVFAC DRAWING NO. 2160990

SHEET SHT# OF TSH#

SIZE: D

DWG. SH. NO. A-2

VALVE AND ACTUATOR SYMBOLS

GATE VALVE OR ANY IN-LINE BLOCK VALVE NOT IDENTIFIED BY TYPE	HAND
GLOBE VALVE	MODULATING
CHECK VALVE	PRESSURE REGULATOR
BALL VALVE	ON / OFF
BUTTERFLY VALVE	MOTOR
PLUG VALVE	SOLENOID
SLIDE GATE VALVE	
NEEDLE VALVE	
IN-LINE PRESSURE RELIEF VALVE	
NORMALLY CLOSED VALVE	
DIAPHRAGM VALVE	
PINCH VALVE	
THREE WAY VALVE.	
FOUR WAY VALVE	
ANGLE GLOBE VALVE	
PRESSURE RELIEF VALVE	
VACUUM RELIEF VALVE	
PRESSURE RELIEF VALVE WITH DRIP PAN	
AIR RELIEF VALVE	

FITTING SYMBOLS

- Y-STRAINER
- SHOWER
- SEWER OR DRAIN
- EXPANSION JOINT
- ORIFICE PLATE
- PULSATION DAMPENER
- REDUCER
- STEAM TRAP
- FILTER STRAINER
- RUPTURE DISC
- HOSE COUPLING
- QUICK CONNECT HOSE COUPLING
- HOSE STATION
- SIGHT GLASS
- FLEXIBLE HOSE
- CALIBRATION COLUMN
- EDUCTOR
- BACK FLOW PREVENTER
- UNION

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED
- REAR OF PANEL OR RACK MOUNTED
- FRONT OF PANEL MOUNTING
- ANY CONVERTER WITH APPROPRIATE SIGNAL DESIGNATION FOR INPUT/OUTPUT (NOTE 2)
- PROCESS INTERLOCK
- ALARM ACTIVATED LIGHT
- ALARM ACTIVATED HORN
- PITOT TUBE
- SHARED DISPLAY FUNCTION (BLIND)
- SHARED DISPLAY FUNCTION (OPERATOR ACCESS.)
- COMPUTER FUNCTION (BLIND)
- COMPUTER FUNCTION (OPERATOR ACCESS.)
- PLC LOGIC FUNCTION (BLIND)
- PLC LOGIC FUNCTION (OPERATOR ACCESS)
- PLC INTERLOCK
- POSITIVE TERMINAL
- NEGATIVE TERMINAL
- SHIELDED GROUND
- POSITIVE TERMINAL
- NEGATIVE TERMINAL
- AIR SUPPLY
- INPUT
- AIR SET
- AIR SUPPLY

EQUIPMENT SYMBOLS

- CENTRIFUGAL PUMP
- SUBMERSIBLE PUMP
- MIXER
- FAN OR BLOWER
- METERING PUMP
- AIR COMPRESSOR
- AIR ACTUATED DIAPHRAGM PUMP

DATA SYMBOLS

- SPECIFICATION CHANGE
- VALVE NUMBER
- X"-XXX — LINE ID., SERVICE DESIGNATION, LINE SIZE
- P-117 — P&ID DWG NUMBER TO WHICH LINE TO CONTINUE; P&ID INTERCONNECT REFERENCE

INSTRUMENT LINE SYMBOLS

- CONNECTION TO PROCESS OR INSTRUMENT IMPULSE LINE
- INSTRUMENT PNEUMATIC SIGNAL LINE (3-15 PSIG UNLESS NOTED OTHERWISE)
- INSTRUMENT ELECTRONIC SIGNAL LINE (CURRENT OR VOLTAGE AS NOTED ON SPEC SHEETS)
- FIELD TUBING OR CAPILLARY FOR THERMAL ELEMENTS AND PRESSURE SEALS
- INTERNAL SYSTEM LINK (SOFTWARE OR DATA LINK)

PIPING LINE SYMBOLS

- NEW PRIMARY FLOW
- ALL OTHER NEW
- TUBE

NOTES

1) SPECIFIC ANALYSIS IS NOTED OUTSIDE SYMBOL CIRCLE.
   EXAMPLE: AI 02

   FUNCTION IDENTIFICATION FOR SPECIAL PROCESS VARIABLES:

COMB.	COMBUSTIBLES
O2	OXYGEN CONCENTRATION
SO2	SULFUR DIOXIDE CONCENTRATION
ORP	OXYGEN REDUCTION POTENTIAL
pH	HYDROGEN ION CONCENTRATION
DO	DISSOLVED OXYGEN
TU	TURBIDITY
H2S	HYDROGEN SULFIDE
OL TRIP	MOTOR OVERLOAD TRIP

2) DESIGNATION: SIGNAL: CONVERTORS

E	VOLTAGE
I	CURRENT
P	PNEUMATIC
R	RESISTANCE

3) INSTRUMENT DESIGNATIONS BASED ON INSTRUMENT SOCIETY OF AMERICA, STANDARD S5.1.

4) THIS LEGEND APPLIES TO DRAWINGS P-1 THRU P-11 AND E-14 THRU E-33.

PIPE SERVICE DESIGNATIONS

A	AIR
BR	BACKWASH RECYCLE
BW	BACKWASH
CF	CHEMICAL FEED
CW	CITY WATER
CWH	CITY WATER, HOT
DE	DECANT
DR	DRAIN
FPW	FIRE PROTECTION WATER
GW	GROUNDWATER
H202	HYDROGEN PEROXIDE
OF	OVERFLOW
PS	SLUDGE PRESSATE
PW	PROCESS WATER
SAN	SANITARY SEWER
SD	SUMP PUMP
SL	SLUDGE
V	VENT

INSTRUMENT ABBREVIATIONS

A	AIR SET
S	SUPPLY
I	INPUT
H	HOT
N	NEUTRAL
B	BLACK
W	WHITE
O	OPEN
NO	NORMALLY OPEN
C	CLOSED
NC	NORMALLY CLOSED
L1	120 VOLTS HOT
VAC	VOLTS ALTERNATING CURRENT
mADC	MILLIAMPERE DIRECT CURRENT
TWSP	TWISTED SHIELDED PAIR

EQUIPMENT ABBREVIATIONS

EW	EXTRACTION WELL	RF	ROTARY FEEDER
P	PUMP	MRF	MOTOR ROTARY FEEDER
MP	PUMP MOTOR	EH	EMERSION HEATER
T	TANK	I	THERMAL OXIDIZER
C	CLARIFIER	MC	CLARIFIER MOTOR
E	EDUCTOR	MF	MOTOR FAN
FP	FILTER PRESS	MB	BLOWER MOTOR
F	FAN	SC	SCRUBBER
M	MIXER	AC	AIR COMPRESSOR
MM	MIXER MOTOR	D	DEPLUMER
S	SEPARATOR	SA	SAMPLE VALVE
B	BLOWER	WS	WATER SOFTENER
ST	STACK	AD	AIR DRYER
BL	BOILER	MAC	AIR COMPRESSOR MOTOR
H	HEATER	MFP	MOTOR FILTER PRESS

INSTRUMENT DESIGNATIONS

SYMBOL	1ST LETTER	2ND LETTER	3RD/4TH/5TH LETTER
A	ANALYSIS (NOTE 1)	ALARMS	ALARMS
B	BLOWER		
C	CONDUCTIVITY/CURRENT	CONTROL	CONTROL
D	DIFFERENTIAL	DIFFERENTIAL	
E	VOLTAGE	ELEMENT	
F	FLOW	FUNCTION	
H	HAND		HIGH
I	CURRENT	INDICATING	INDICATING
J	POWER		
K	TIMER		
L	LEVEL/LOGIC	LEVEL	LOW/LEVEL/LIGHT
M	MOISTURE	MEDIUM	MEDIUM
P	PRESSURE(VACUUM)	PRESSURE(VACUUM)	
Q		TOTALIZING	
R	RECORDING	RECORDING	RECORDING
S	SPEED	SWITCH	SWITCH
T	TEMPERATURE/TIMER	TRANSMITTER	TRANSMITTER
V		VALVE	VALVE
Y	LOGIC FUNCTION	RELAY	
Z	LIMIT		

ABB Environmental Services, Inc. Portland ME

REV. | DESCRIPTION | PREP BY | DATE | APPRVD

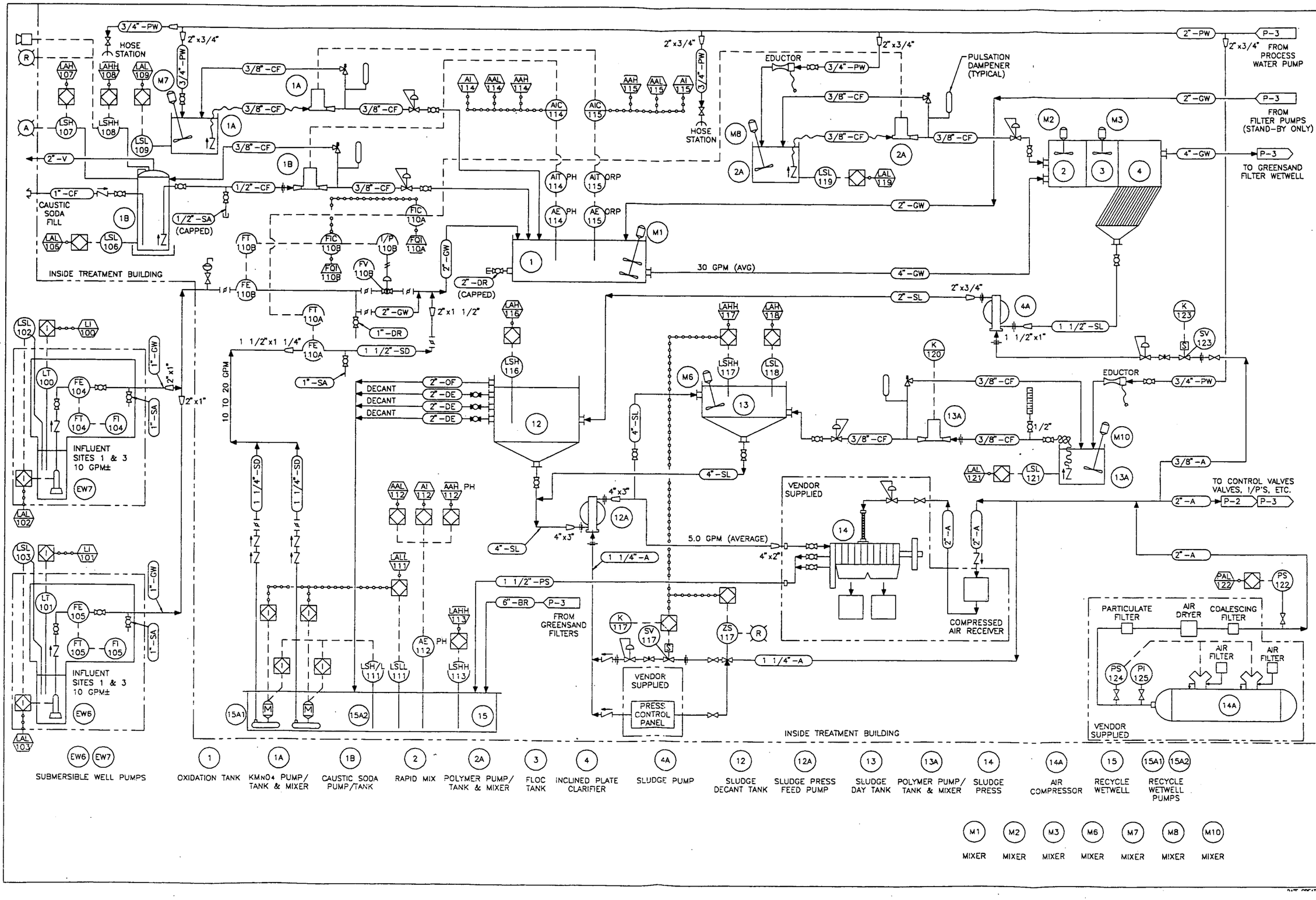
NAVAL FACILITIES ENGINEERING COMMAND — NORTHERN DIVISION — DEPARTMENT OF THE NAVY — LESTER, PENNSYLVANIA — NAVAL AIR STATION — BRUNSWICK, MAINE

SEAL AREA

SITES 1&3,5,6,8 AND EASTERN PLUME

GROUNDWATER TREATMENT BUILDING
PIPING & INSTRUMENTATION SYMBOLS

SAT TO | DATE
SAT TO | DATE
CODE I.D. NO. 80091
SCALE : N.T.S.
SPEC. NO. 04-91-0034
CONSTR. CONTR. NO. N62472-91-C-0034
MANFAC DRAWING NO. 2161001
SHEET 5H01 OF 75HC
SIZE: D | DWG. SH. NO. P-1


3/4"-PW
HOSE STATION
2"x3/4"
3/8"-CF
1A
1B
2"-V
1"-CF
CAUSTIC SODA FILL
1/2"-SA (CAPPED)
INSIDE TREATMENT BUILDING
LAH 107
AHH 108
AL 109
LSH 107
LSHH 108
LSL 109
AL 105
LSL 106
M7
FT 110B
FIC 110B
FOI 110B
1/P 110B
FQI 110A
FIC 110A
FV 110B
FE 110B
2"-GW
2"-DR (CAPPED)
AI 114
AAL 114
AAH 114
AIC 114
AIT PH 114
AE PH 114
AIC 115
AAH 115
AAL 115
AI 115
AIT ORP 115
AE ORP 115
M1
1
30 GPM (AVG)
4"-GW
EDUCTOR
PULSATION DAMPENER (TYPICAL)
M8
2A
LSL 119
AL 119
M2
M3
2
3
4
P-3
2"-PW
FROM PROCESS WATER PUMP
FROM FILTER PUMPS (STAND-BY ONLY)
TO GREENSAND FILTER WETWELL
2"-SL
4A
1 1/2"-SL
K 123
SV 123
K 120
LSL 102
LI 100
LT 100
FE 104
FT 104
FI 104
1"-GW
1"-SA
2"x1"
INFLUENT SITES 1 & 3 10 GPM±
EW7
LAL 102
LSL 103
LI 101
LT 101
FE 105
FT 105
FI 105
EW6
LAL 103
1"-DR
2"x1 1/2"
1 1/2"x1 1/4"
FE 110A
FT 110A
1 1/2"-SD
10 TO 20 GPM
LAH 116
LSH 116
DECANT
2"-OF
2"-DE
12
1 1/4"-SD
AAL 112
AI 112
AAH 112 PH
ALL 111
LSH/L 111
LSLL 111
AE 112 PH
LAHH 113
LSHH 113
15A1
15A2
15
4"-SL
4"x3"
12A
1 1/4"-A
5.0 GPM (AVERAGE)
4"x2"
VENDOR SUPPLIED
14
2"-A
COMPRESSED AIR RECEIVER
1 1/2"-PS
6"-BR
P-3
FROM GREENSAND FILTERS
LAHH 117
LAH 118
LSHH 117
LSL 118
M6
13
13A
3/8"-CF
1/2"
LAL 121
LSL 121
M10
3/8"-A
TO CONTROL VALVES VALVES, I/P'S, ETC.
P-2
PAL 122
PS 122
K 117
SV 117
ZS 117
R
VENDOR SUPPLIED
PRESS. CONTROL PANEL
PARTICULATE FILTER
AIR DRYER
COALESCING FILTER
AIR FILTER
PS 124
PI 125
14A
VENDOR SUPPLIED
INSIDE TREATMENT BUILDING
SUBMERSIBLE WELL PUMPS
OXIDATION TANK
KMnO4 PUMP/ TANK & MIXER
CAUSTIC SODA PUMP/TANK
RAPID MIX
POLYMER PUMP/ TANK & MIXER
FLOC TANK
INCLINED PLATE CLARIFIER
SLUDGE PUMP
SLUDGE DECANT TANK
SLUDGE PRESS FEED PUMP
SLUDGE DAY TANK
POLYMER PUMP/ TANK & MIXER
SLUDGE PRESS
AIR COMPRESSOR
RECYCLE WETWELL
RECYCLE WETWELL PUMPS
MIXER
ABB Environmental Services, Inc. Portland ME
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
DEPARTMENT OF THE NAVY
LISTER
NAVAL AIR STATION
BRUNSWICK, MAINE
SITES 1&3,5,6,8 AND EASTERN PLUME
GROUNDWATER TREATMENT BUILDING
PIPING & INSTRUMENTATION DIAGRAM
SAY TO
SAY TO
CODE I.D. NO. 80091
SCALE : N.T.S.
SPEC. NO. 04-91-0034
CONTRACT CONTR. NO. N62472-91-C-0034
MANFAC DRAWING NO. 2161002
SHEET SHT# OF TSHT
SIZE D
DWG. NO. IP-2

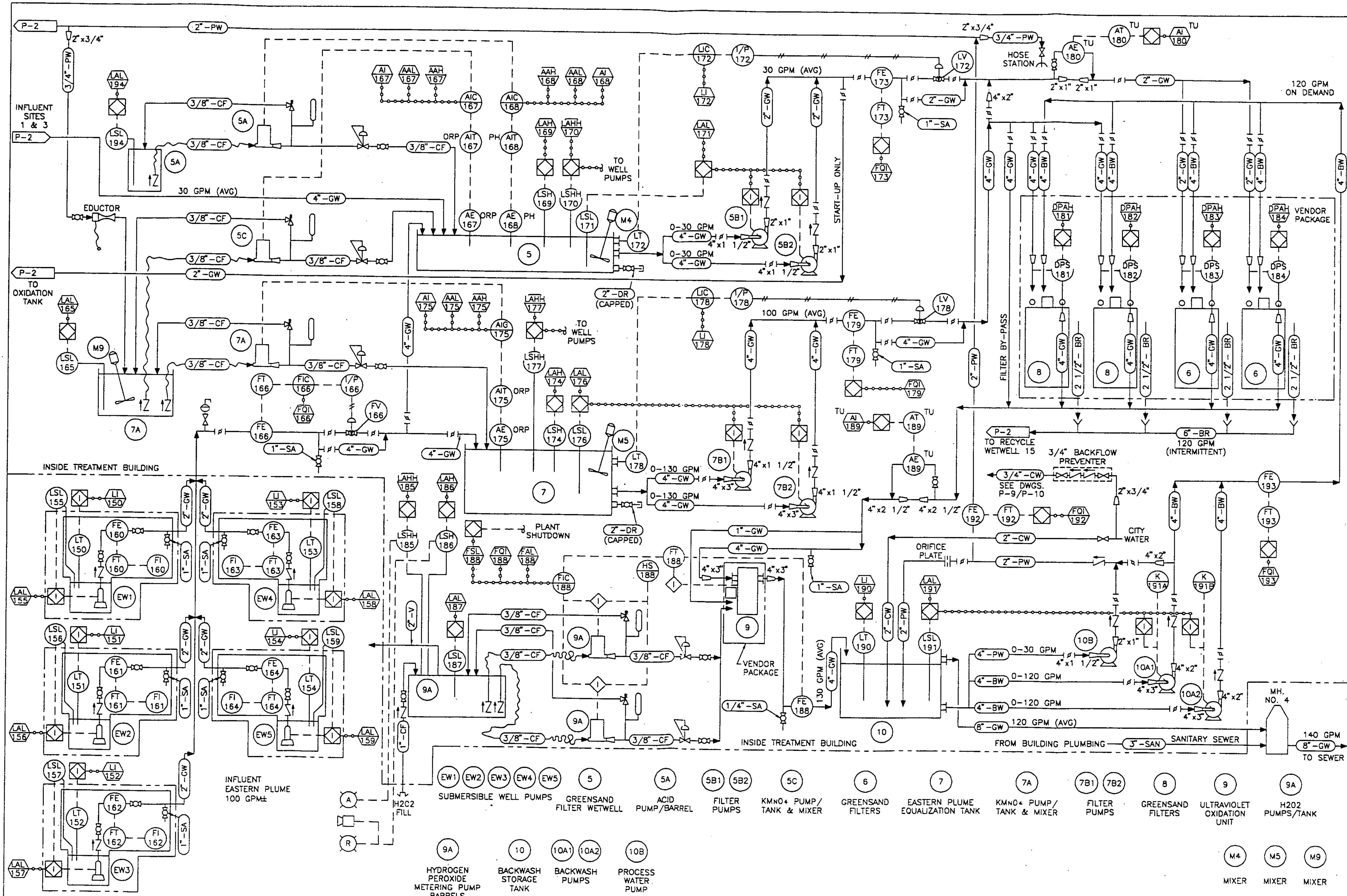


ABB Environmental Services, Inc. Portland ME

DEPARTMENT OF THE NAVY

NAVAL FACILITIES ENGINEERING COMMAND

NORTHERN DIVISION

NAVAL AIR STATION BRUNSWICK, MAINE

SITES 1&3,5,6,8 AND EASTERN PLUME

GROUNDWATER TREATMENT BUILDING
PIPING & INSTRUMENTATION DIAGRAM

CODE I.D. NO.	80091
SCALE:	N.T.S.
SPEC. NO.	04-91-0034
CONSTR. CONTR. NO.	N62472-91-C-0034
NAVFAC DRAWING NO.	2161003
SIZE: D	P-3

Post-it® Fax Note 7671	Date 4/7	# of pages ▶ 5
To Tom Schwartz	From Mike Germaine	
Co./Dept. Woodard + Cunnam	Co. W. H. Shurtleff	
Phone #	Phone # 800 262 5446	
Fax # 774-4751	Fax # 207 885-0569	

Material Safety Data Sheet

CAIROX®
Potassium Permanganate

NFPA* HAZARD SIGNAL

Health Hazard (less than 1 hour exposure)	1 =	Materials which under fire conditions would give off irritating combustion products. Materials which on the skin could cause irritation.
Flammability Hazard	0 =	Materials that will not burn.
Reactivity Hazard	0 =	Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.
Special Hazard	OXY =	Oxidizer

*National Fire Protection Association 704

Section I Product Identification

MANUFACTURER'S NAME: CARUS CORPORATION — TELEPHONE NUMBER FOR INFORMATION: 1-815/433-9070

MANUFACTURING FACILITY: Carus Chemical Company, 1500 Eighth Street, LaSalle, IL 61301 — EMERGENCY TELEPHONE NO.: 1-800/435-6856; CHEMTREC TELEPHONE NO.: 1-800/424-9300

PRODUCT NAME: CAIROX® Potassium Permanganate, $KMnO_4$ — TRADE NAME: CAIROX® Potassium Permanganate

SYNONYMS: Permanganic acid potassium salt
Chameleon mineral
Condy's crystals
Permanganate of potash

DEPARTMENT OF TRANSPORTATION INFORMATION:

Proper Shipping Name: 49CFR172.101	Potassium Permanganate
ID Number: 49CFR172.101	UN 1490
Hazard Class: 49CFR172.101	Oxidizer
Multiple Labeling Requirements: 49CFR172.402(a)(9)	Corrosive
Hazardous Substance Reportable Quantity: 40CFR116.4; 40CFR302.4	RQ-100 lb.

Chemtrec Telephone No. (800) 424-9300

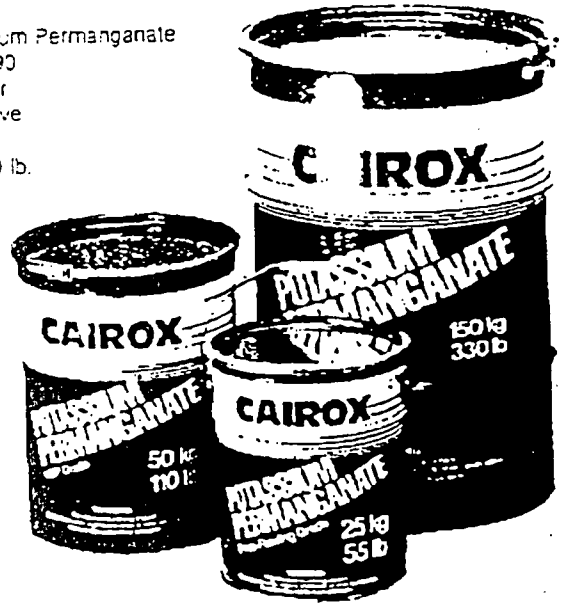
RCRA: Oxidizers such as potassium permanganate meet the criteria of ignitable waste. 40 CFR261.21

Registry of Toxic Effects of Chemical Substances
RTECS #SD6475000

CAIROX® Potassium Permanganate contains 33-35% manganese as part of the chemical infrastructure (manganese compounds CAS Reg. No. N/A) and is subject to the reporting requirements of Section 313 of Title III, Superfund Amendments and Reauthorization Act of 1986 and 40 CFR372.

FIRST RESPONDERS:

Wear protective gloves, boots, goggles, and respirator. In case of fire, wear positive pressure breathing apparatus. Approach incident with caution. Use Emergency Response Guide 35 (DOT P5800.4).



carus
CHEMICAL COMPANY

Section II Hazardous Ingredients

Material or component	CAS No.*	%	Hazard Data
Potassium Permanganate	7722-64-7	97% min. $KMnO_4$	PEL** C*** 5 mg Mn per cubic meter of air TLV-TWA*** 5 mg Mn per cubic meter of air 5 mg Mn per cubic meter of air is equivalent to 0.0046 ounces per 1000 cubic feet of air.

*Chemical Abstract Service Number

**OSHA Permissible Exposure Limit, manganese compounds (expressed as Mn) 29CFR1910.1000 Table Z-1.

***American Conference of Governmental Hygienists 1988/1989, for manganese dust and compounds, expressed as Mn. TLV-TWA = The time weighted average concentration for a normal 8 hour workday and a 40 hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

****Ceiling Exposure Limit or maximum exposure concentration not to be exceeded under any circumstances.

Section III Physical Data

BOILING POINT, 760 mm Hg	Not applicable	SPECIFIC GRAVITY	2.7 g/cm³ 20°C (68°F)
VAPOR PRESSURE (mm Hg)	Not applicable	VAPOR DENSITY (AIR = 1)	Not applicable
SOLUBILITY IN WATER % BY SOLUTION	6.0% at 20°C (68°F), and 20% at 65°C (149°F)		
PERCENT VOLATILE BY VOLUME	Not Volatile	EVAPORATION RATE (BUTYL ACETATE = 1)	Not applicable
MELTING POINT	Starts to decompose with evolution of oxygen (O_2) at temperatures above 150°C (302°F)		
APPEARANCE AND ODOR	Dark purple solid with a metallic luster, odorless		

Section IV Fire and Explosion Hazard Data

The material itself is noncombustible but will accelerate the burning of combustible material.

FLASHPOINT	None
FLAMMABLE OR EXPLOSIVE LIMITS	Lower: Nonflammable Upper: Nonflammable
EXTINGUISHING MEDIA	Use large quantities of water
SPECIAL FIREFIGHTING PROCEDURES	Watch for rapid burning and be prepared to retreat to a safe distance. If yellow, white or brown fumes are present, wear positive pressure breathing apparatus and full protective clothing.
UNUSUAL FIRE AND EXPLOSION HAZARDS	Powerful oxidizing material. May decompose spontaneously if exposed to intense heat (150°C/302°F). May be explosive in contact with some other chemicals. May react violently with finely divided and readily oxidizable substance. Increases flammability of combustible materials.

Section V Health Hazard Data

POTASSIUM PERMANGANATE: Acute oral LD_{50}(rat) = 780 mg/kg Male (14 days) 525 mg/kg Female (14 days)
The fatal dose by ingestion is estimated to be 10 grams or 0.35 ounces.

ROUTES OF EXPOSURE

1. Inhalation
   Acute inhalation toxicity data are not available; however, airborne concentrations of potassium permanganate in the form of dust, mist, or spray may irritate and cause damage to the respiratory tract.
2. Skin Contact
   Prolonged contact of solutions at room temperature may be irritating to the skin, leaving brown stains on the skin. Concentrated solutions at elevated temperature and crystals are corrosive to the skin.
3. Eye Contact
   Potassium permanganate is corrosive to eye tissue on contact. It may cause severe burns that result in damage to the eye.
4. Ingestion
   Potassium permanganate, if swallowed, may cause severe burns to mucous membranes of the mouth, throat, esophagus, and stomach.

continued

Health Hazard Data (cont.)

EFFECTS OF OVEREXPOSURE

1. Acute Overexposure (instantaneous overexposure)
   Irritating or corrosive to body tissue on contact
2. Chronic Overexposure (long term overexposure)
   Prolonged exposure, usually many years, to heavy concentrations of dust and fumes above the TLV-value, mainly in the form of manganese oxides may lead to lung irritation and central nervous system disorder. The symptoms may simulate Parkinson's disease. No known cases of central nervous system disorders due to exposure to $KMnO_4$ have been reported.
3. Carcinogenicity
   Potassium permanganate has not been classified as a carcinogen by OSHA, NTP, IARC.
4. Medical Conditions Generally Aggravated by Exposure
   Potassium permanganate will cause further irritation of tissue or open wounds, burns and mucous membranes.

EMERGENCY AND FIRST AID PROCEDURES

1. Eyes
   Immediately flush eyes with large amounts of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Do not attempt to use a chemical antidote. Seek medical attention immediately.
2. Skin
   Immediately wash contaminated areas with plenty of water. Remove contaminated clothing and footwear. Wash clothing and decontaminate footwear before use. Seek medical attention immediately if irritation is severe.
3. Inhalation
   Get person out of contaminated area to fresh air. If breathing has stopped, resuscitate and administer oxygen if readily available. Seek medical attention immediately.
4. Ingestion
   Never give anything by mouth to an unconscious or convulsing person. If conscious, give large quantities of water. Seek medical attention immediately.

Section VI Reactivity Data

STABILITY Under normal conditions, the material is stable.

CONDITIONS TO AVOID Contact with incompatible materials or heat (>150°C/302°F) Do not mix with formaldehyde.

INCOMPATIBLE MATERIALS Contact with acids, peroxides, and all combustible organic or readily oxidizable materials including inorganic oxidizable materials and metal powders. With hydrochloric acid, chlorine gas is liberated.

HAZARDOUS DECOMPOSITION PRODUCTS When involved in fire, corrosive fumes or smoke may be formed.

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION Material is not known to polymerize.

Section VII Spill or Leak Procedures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Clean up spills immediately by sweeping or shoveling up the material; do not return contaminated material to original drum. Transfer to a clean metal drum. EPA banned the land disposal of D001 ignitable waste oxidizers. These wastes have to be deactivated by reduction (see below). To clear contaminated floors flush with abundant quantities of water into sewer, if permitted by Federal, State, and Local regulations. If not, collect water and treat chemically. (See below)

DEACTIVATION OF D001 IGNITABLE WASTE OXIDIZERS BY CHEMICAL REDUCTION

Reduce material in aqueous solution with sodium thiosulfate (Hypo), a bisulfite or ferrous salt solution. The bisulfite or ferrous salt may require some dilute sulfuric acid to promote rapid reduction. Neutralize with sodium bicarbonate to neutral pH if acid was used. Decant or filter and mix formed sludge with sodium carbonate and deposit in an approved landfill. Where permitted, the sludge can be drained into sewer with large quantities of water. Contact Carus Chemical for additional recommendations.

Section VIII Protective Equipment to Be Used

VENTILATION REQUIREMENTS
Provide sufficient mechanical and/or local exhaust to maintain exposure below the Permissible Exposure Limit.

RESPIRATORY PROTECTION
In the case where overexposure may exist, the use of NIOSH-MSHA dust and mist respirator (such as NIOSH-MSHA TC-21C-287) or an air supplied respirator is advised. Engineering or administrative controls should be implemented to control dust.

EYE
Face shield and/or goggles should be worn.

GLOVES
Rubber or plastic gloves should be worn.

OTHER PROTECTIVE EQUIPMENT
Normal work clothing covering arms and legs and rubber apron should be worn.

WORK/HYGIENIC PRACTICES
Wash thoroughly with soap and water after handling and before eating or smoking.

Section IX Special Precautions and Other Comments

Protect containers against physical damage. Store in a cool, dry area in closed containers. Segregate from acids, peroxides and all combustible, organic or easily oxidizable materials.

DEPARTMENT OF TRANSPORTATION INFORMATION:

Proper Shipping Name: 49CFR172.101	Potassium Permanganate
ID Number: 49CFR172.101	UN 1490
Hazard Class: 49CFR172.101	Oxidizer
Multiple Labeling Requirements: 49CFR172.402(a)(9)	Corrosive
Hazardous Substance Reportable Quantity: 40CFR116.4; 40CFR302.4	RQ-100 lb.

Chemtrec Telephone No. (800) 424-9300

RCRA: Oxidizers as potassium permanganate meet the criteria of ignitable waste. 40 CFR261.21

FIRST RESPONDERS:
Wear protective gloves, boots, goggles, and respirator. In case of fire, wear positive pressure breathing apparatus. Approach incident with caution. Use Emergency Response Guide 35 (DOT P5800.4).

Registry of Toxic Effects of Chemical Substances
RTECS #SD6475000
CAIROX® Potassium Permanganate contains 33-35% manganese as part of the chemical infrastructure (manganese compounds CAS Reg. No. N/A) and is subject to the reporting requirements of Section 313 of Title III, Superfund Amendments and Reauthorization Act of 1986 and 40 CFR372.

Name: Horst R. Adolf

Signature: Horst R. Adolf

Revision Date: January 1991

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change and the conditions of handling; use or misuse of the product are beyond our control. CARUS CHEMICAL COMPANY MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. CARUS ALSO DISCLAIMS ALL LIABILITY FOR RELIANCE ON THE COMPLETENESS OR CONFIRMING ACCURACY OF ANY INFORMATION INCLUDED HEREIN. Users should satisfy themselves that they are aware of all the current data relevant to their particular uses.

carus CHEMICAL COMPANY
Division of Carus Corporation
1001 Boyce Memorial Drive
Ottawa, Illinois 61350
Telephone 815/433-9970 Cable: Carchemco
Telex: 797551

MARSULEX INC.

MATERIAL SAFETY DATA SHEET

Sulfuric Acid

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sulfuric Acid | Formula: H_2SO_4 | Molecular Weight: 98.08
Chemical Name: Sulfuric Acid | Chemical Family: Inorganic Acid | CAS# 7664-93-9
Synonyms: Sulphuric Acid, Oil of Vitriol, Battery Acid
Product Use: Used in manufacture of fertilizers, explosives, other acids, metal pickling and petroleum processing.

MARSULEX Inc.
111 Gordon Baker Road
Suite 300
North York, ONT
M2H 3R1
(416) 496-9655

MARSULEX Inc.
40 Richards Avenue
P.O. Box 5453
Norwalk, CT
06856-5453
(203) 854-0300

EMERGENCY TELEPHONE NUMBER
(800) 263-9502

▲ Prepared by MARSULEX Technical Section (416) 496-4164.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Ingredients	% by Wt.	CAS Number
Sulfuric Acid	70-100%	7664-93-9
Non-Hazardous Ingredients		
Water	0-30%	7732-18-5

3. HAZARD INFORMATION

EMERGENCY OVERVIEW:

Danger! Extremely corrosive. Causes severe burns. Reacts violently with water. Highly reactive and capable of igniting combustible materials on contact. Not flammable, but reacts with most metals to form explosive hydrogen gas.

Sulfuric Acid is a colorless to amber, clear to slightly cloudy, oily liquid.

▲ **National Fire Protection Association (NFPA) Rating**
Hazardous Materials Identification System (HMIS) Rating

	NFPA	HMIS
HEALTH	3	3
FIRE	0	0
REACTIVITY	2	2
SPECIAL	W	

4 = Extreme/Severe
3 = High/Serious
2 = Moderate
1 = Slight
0 = Minimum
W = Water Reactive

3. HAZARD INFORMATION (continued)

POTENTIAL HEALTH EFFECTS:

Exposure Limits:

	ACGIH (TLV)	OSHA (PEL)
Sulfuric Acid	1 mg/m^3 (TWA)	1 mg/m^3 (TWA)
	3 mg/m^3 (STEL)	

In contact with the skin: Concentrated solution may cause pain and severe burns to the skin and brownish or yellow stains. Prolonged and repeated exposure to dilute solutions may cause irritation, redness, pain and drying and cracking of the skin.

In contact with the eyes: Immediate pain, severe burns and corneal damage which may result in blindness.

Inhaled: Mists and vapors may cause irritation of the eyes, nose and respiratory tract. May cause increased pulmonary resistance, transient cough and bronchoconstriction. Severe overexposure may result in lung collapse and pulmonary edema which can be fatal.

Ingested: Severe burning and pain in the mouth, throat and abdomen. Vomiting, diarrhea and perforation of the esophagus and stomach lining may occur.

Long Term Exposure:
Repeated exposure may produce erosion and discoloration of teeth.

Although no direct link has been established between exposure to sulfuric acid, itself, and cancer in man, the World Health Organization (WHO) International Agency for Research on Cancer (IARC) have concluded that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to man, causing cancer of the larynx (the voice box) and, to a lesser extent, the lung. Exposure to any mist or aerosol during the use of this product should be avoided and, in any case, keep exposures below the occupational exposure limit for sulfuric acid.

Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Repeated overexposure may lead to contact dermatitis, may cause bronchitis with cough, phlegm, shortness of breath and emphysema, can cause chronic runny nose, tearing of the eyes, nosebleeds and stomach upsets. Strict adherence to first aid measures following **any** exposure is essential.

Existing Medical Conditions Possibly Aggravated By Exposure: Skin irritation may be aggravated in individuals with existing skin lesions. Breathing of vapors or sprays (mists) may aggravate acute or chronic asthma and chronic pulmonary disease such as emphysema and bronchitis.

Carcinogenicity Data: Although there are reports linking exposure to sulfuric acid to cancer, this product is not classified by NTP (National Toxicology Program), not regulated as carcinogenic by OSHA (Occupational Safety and Health Administration), and has not been evaluated by IARC (International Agency for Research on Cancer) or ACGIH (American Conference of Governmental Industrial Hygienists). (See also, Long Term Exposure).

4. FIRST AID MEASURES

Prompt removal of this material from contact with the body is of utmost importance.
START FIRST AID AT ONCE.

▲ **Precaution:** Persons attending the victim should avoid direct contact with heavily contaminated clothing and vomitus. Wear impervious gloves while decontaminating skin and hair.

In contact with the skin: Flush skin with running water for a **minimum** of 20 minutes. Start flushing while removing contaminated clothing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY. Do not transport victim unless the recommended flushing period is completed or flushing can be continued during transport.

▲ While the patient is being transported to a medical facility, apply compresses of iced water. If medical treatment must be delayed, immerse the affected area in iced water. If immersion is not practical, compresses of iced water can be applied. Avoid freezing tissues.

▲ Discard heavily contaminated clothing and shoes in a manner which limits further exposure. Otherwise, wash clothing separately before reuse.

In contact with the eyes: Immediately flush eyes with running water for a **minimum** of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY. Do not transport victim until the recommended flushing period is completed unless flushing can be continued during transport.

Inhaled: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give Cardiopulmonary Resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical attention IMMEDIATELY.

Ingested: If victim is alert and not convulsing, rinse mouth and give ½ to 1 glass of water to dilute material. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY contact local poison control center. Vomiting may need to be induced but should be directed by a physician or a poison control center. IMMEDIATELY transport victim to an emergency facility.

▲ **Note to Physician:** All treatments should be based on observed signs and symptoms of distress in the patient. Medical conditions that may be aggravated by exposure include asthma, bronchitis, emphysema and other lung diseases and chronic nose, sinus or throat conditions. Severity of the burn is generally determined by the concentration of the solution and the duration of exposure. In the event of skin or eye contact, immediate and thorough flushing is essential. Continued washing of the effected area with cold or iced water will be helpful in removing the last traces of sulfuric acid. Cream or ointments should not be applied before or during the washing phase of the treatment.

5. FIRE FIGHTING MEASURES

Flash Point (method): Not applicable, product is non-flammable
Autoignition Temperature: Not combustible
Flammability Limits in air(%): UEL: Not applicable LEL: Not applicable

5. FIRE FIGHTING MEASURES (continued)

Fire Extinguishing Media: For small fires use dry chemical or carbon dioxide. For large fires, flood fire area with water from a distance. Expect violent reaction with water. Do not get solid stream of water on spilled material.

Special Fire Fighting Procedures: Wear a NIOSH/MSHA approved self-contained breathing apparatus if vapors or mists are present and full protective clothing. For fighting fires in close proximity to spill or vapors, use acid-resistant personal protective equipment. Evacuate residents who are downwind of fire. Prevent unauthorized entry to fire area. Dike area to contain runoff and prevent contamination of water sources. Neutralize runoff with lime, soda ash or other suitable neutralizing agents (see Deactivating Chemicals, Section 6). Cool containers that ar exposed to flame with streams of water until fire is out.

Other Fire or Explosion Hazards: Not flammable but highly reactive. Capable of igniting finely divided combustible materials on contact. Reacts violently with water and organic materials with evolution of heat. Extremely hazardous in contact with many materials, particularly carbides, chlorates, fulminates, nitrates and picrates. Sulfuric acid reacts with most metals, especially when dilute to give flammable, potentially explosive hydrogen gas. Hydrogen gas can accumulate to explosive concentrations inside confined spaces. Follow appropriate NFPA codes.

6. ACCIDENTAL RELEASE MEASURES

▲ **Steps to be taken in the event of a spill or leak:** Remove all ignition sources. Ventilate area. Use appropriate Personal Protection Equipment. Prevent liquid from entering sewers or waterways. Dike with inert material (sand, earth, etc.). Stop or reduce leak if safe to do so. Collect into containers for reclamation or disposal only if container is suitable to withstand the material. Consider insitu neutralization and disposal. Ensure adequate decontamination of tools and equipment following clean up. Comply with Federal, Provincial/State and local regulations on reporting releases.

Deactivating Chemicals: Lime, limestone, sodium carbonate (soda ash), sodium bicarbonate, dilute sodium hydroxide, dilute aqua ammonia.

Waste Disposal Methods: Dispose of waste material at an approved waste treatment/disposal facility, in accordance with applicable regulations. Do not dispose of waste with normal garbage or to sewer systems.

▲ Note - Clean-up material may be a RCRA Hazardous Waste on disposal.
- Spills are subject to CERCLA reporting requirements: RQ = 1000 lbs.

7. HANDLING AND STORAGE

Precautions: Wear appropriate Personal Protection Equipment. Do not breath sprays or mists. Do not ingest. Do not get in eyes, on skin or on clothing. Keep ignition sources away from sulfuric acid storage, handling and transportation equipment.

Handling Procedures and Equipment: Carbon steel or stainless steel materials are suitable for use for acid concentrations equal to or greater than 93%. However, the effect of lower concentrations on the materials of construction can be very complex. Contact product supplier for specific recommendations when handling sulfuric acid at strengths less than 77%.

7. HANDLING AND STORAGE (continued)

Storage Temperature: Store above freezing point (Section 9). Elevated temperatures will increase the corrosion rate of most metals.

Storage Requirements: Store packaged acid in a dry, well, ventilated location away from combustibles, oxidizers, bases, or metallic powders. Storage tanks should be protected from water ingress, be well ventilated, and maintained structurally in a safe and reliable condition.

Other Precautions: Sulfuric acid will attack some forms of plastics and coatings. Always add acid to water - not water to acid. If kept in upper floors of building, floors should be acid proof with drains to a recovery tank.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Recommendations listed in this section indicate the type of equipment which will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: Local exhaust ventilation required.

Respiratory Protection: A NIOSH/MSHA approved air-purifying respirator equipped with acid gas/fume, dust, mist cartridges for concentrations up to 10 mg/m^3. An air-supplied respirator if concentrations are higher or unknown.

Skin Protection: Impervious (i.e., neoprene, PVC) gloves, coveralls, boots and/or other acid resistant protective clothing.

Eye Protection: Tight-fitting chemical goggles and face shield.

Other Personal Protective Equipment: Where there is a danger of spilling or splashing, acid resistant aprons or suits should be worn. Trouser legs should be worn outside (not tucked in) rubber boots. Safety showers and eyewash fountains should be installed in storage and handling areas.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid

Appearance and Odor: Sulfuric acid is a clear to amber, heavy, oily liquid which may have a sharp penetrating odor.

Odor Threshold: No data

▲ **Boiling Point:** 77.67%: 193°C (380°F); 93.19%: 276°C (529°F); 98%: 330°C (626°F)

▲ **Melting/Freezing Point:** 77.67%: -11.2°C (+11.6°F); 93.19%: -29.5°C (-21.1°F); 98%: -1.1°C (30°F)

▲ **Vapor Pressure at 40°C (102°F):** 77.67%: 1.2 mmHg; 93.19%: 0.0016 mmHg; 98%: 0.002 mmHg

▲ **Specific Gravity at 15°C (60°F):** 77.67%: 1.7059; 93.19%: 1.8354; 98%: 1.8437

▲ **Vapor Density:** (Air=1): 3.4 sulfuric acid component

Bulk Density: Not applicable (see specific gravity)

9. PHYSICAL AND CHEMICAL PROPERTIES (continued)

Evaporation Rate: Not applicable
Solubility: Miscible in all proportions in water. Also soluble in alcohol.
pH: 0.3 (1N solution at 25°C/78°F)

10. STABILITY AND REACTIVITY

Stability:
Under Normal Conditions: Stable, but reacts violently with water and organic materials with evolution of heat.
Under Fire Conditions: Decomposes to form sulfur oxides(SO_x).

Conditions to Avoid: Temperatures which may have a negative effect on the materials of construction used in equipment.

Materials to Avoid: Contact with organic materials (such as chlorates, carbides, fulminates and picrates) may cause fire and explosions. Contact with metals may produce flammable hydrogen gas. When diluting, add acid to water. Do NOT add water to the acid.

Hazardous Decomposition or Combustion Products: Toxic gases and vapors (e.g. sulfur dioxide, sulfuric acid vapors/mists and sulfur trioxide) may be released when sulfuric acid decomposes.

Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

Toxicological Data: LD_{50} (oral, rat) = 2140 mg/kg
LC_{50} (inhalation, rat) = 510 mg/m^3 for 2 hrs
Skin effects (rabbit): Severe irritation
Eye effects (rabbit): Severe irritation

Carcinogenicity Data: Although there are reports linking exposure to sulfuric acid to cancer, this product is not classified by NTP (National Toxicology Program), not regulated as carcinogenic by OSHA (Occupational Safety and Health Administration), and has not been evaluated by IARC (International Agency for Research on Cancer) or ACGIH (American Conference of Governmental Industrial Hygienists). See Section 3. Hazard Information, regarding Potential Health Effects (Long Term Exposure) for further discussion.

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.

Teratogenicity Data: No information is available and no adverse teratogenic effects are anticipated.

Synergistic Materials: None known

12. ECOLOGICAL INFORMATION

Ecotoxic Effects: Harmful to aquatic life in very low concentrations. May be dangerous if it enters water intake; Fish toxicity critical concentration = 10 mg/L; 7.34 mg/L/48 hrs - Lymneae Palustris - 0-100% mortality.

13. DISPOSAL CONSIDERATIONS

- Responsibility for proper waste disposal is with the owner of the waste. Work with the appropriate regulatory bodies to ensure compliance with regulations.
- Consider the collection of residual sulfuric acid into containers for reclamation or disposal only if the container is suitable to withstand the material.
- Consider insitu neutralization and disposal.
- Clean-up material may be a RCRA Hazardous Waste on disposal.
- Provincial/State or local regulations or restrictions are complex and may differ from Federal regulations.
- The information applies to the material as manufactured; processing, neutralizing, use or contamination may make the information inappropriate, inaccurate or incomplete.

14. TRANSPORT INFORMATION

U.S. (Under DOT)

Shipping Name: RQ Sulfuric acid
Hazard Class or Division: 8
Product Identification No. (PIN): UN1830
Packing Group: II

Canada (Under TC)

Shipping Name: Sulphuric acid
Classification(s): Class 8 (9.2)
Product Identification No. (PIN): UN1830
Packing Group: II

15. REGULATORY INFORMATION

U.S.A.

SARA Title III HAZARD CATEGORIES AND LISTS

Product Hazard Categories		Lists	
Acute (Immediate) Health:	Yes	Extremely Hazardous Substance (40 CFR 355, SARA Title III Section 302)	Yes
Chronic (Delayed) Health:	Yes		
Fire:	No	CERCLA Hazardous Substance (40 CFR 302.4)	Yes
Reactivity:	Yes		
Sudden Release of Pressure:	No	Toxic Chemical (40 CFR 372.65, SARA Title III Section 313)	Yes

15. REGULATORY INFORMATION (continued)

Reportable Quantity (RQ) under U.S. EPA CERCLA: RQ=1000 lb

TSCA Inventory Status: Reported/Included

CANADA

Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification(s): Class E - Corrosive
Class D1A - Very Toxic

WHMIS Health Effects Index: Acute Lethality - very toxic - Immediate
Corrosive to animal skin

WHMIS Ingredient Disclosure List: Confirmed A; Meets criteria for disclosure at 1% or greater.

Reportable Quantity (RQ) under Transport Canada - TDG:
RQ=5 litres (or Kg) if it represents a danger to health, life, property or the environment.

16. OTHER INFORMATION

Additional Information and References

1. Enviro-TIPS Manual, "Sulphuric Acid and Oleum", Environment Canada, February 1984.
2. Weast, R.C. (Ed.), "CRC Handbook of Chemistry and Physics", 60th Edition (1980)
3. Sax, N.I., "Dangerous Properties of Industrial Materials", 7th Edition (1989)
4. ACGIH, "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices", 1991-92
5. Sittig, Marshall, "Handbook of Toxic and Hazardous Chemicals and Carcinogens", 2nd Edition, 1985

Revision Indicators:

▲ in the left margin indicates a revision or addition of information since the previous issue.

16. OTHER INFORMATION (continued)

Legend:

CAS #	- Chemical Abstracts Service Registry Number
CERCLA	- Comprehensive Environmental Response, Compensation, and Liability Act
CFR	- Code of Federal Regulations
DOT	- Department of Transportation
EPA	- Environmental Protection Agency
LC_{50}	- The concentration of material in air expected to kill 50% of a group of test animals
LD_{50}	- Lethal Dose expected to kill 50% of a group of test animals
LEL	- Lower Explosive Limit
MSHA	- Mine Safety and Health Administration
NIOSH	- National Institute for Occupational Safety and Health
PEL	- Permissible Exposure Limit
PVC	- Polyvinyl chloride
RCRA	- Resource Conservation and Recovery Act
SARA	- Superfund Amendments and Reauthorization Act of the U.S. EPA
STEL	- Short Term Exposure Limit
TC	- Transport Canada
TDG	- Transportation of Dangerous Goods Act/Regulations
TLV	- Threshold Limit Value
TSCA	- Toxic Substances Control Act
TWA	- Time-Weighted Average
UEL	- Upper Explosive Limit

1 - SITE SPECIFIC INFORMATION

MSDS NUMBER: 1390-1

DATE LAST UPDATED: March 4, 1994

MANUFACTURED BY:
LCP Chemicals
Raritan Plaza II, Raritan Center
Edison, NJ 08837
EMERGENCY PHONE NO.:
(800) 624-6938
CHEMTREC: (800) 424-9300

DISTRIBUTED BY:
W. H. Shurtleff Company
P. O. Box 2800
South Portland, ME 04116-2800
(207) 883-6371

FIRST DISTRIBUTED BY:
W. H. Shurtleff Company

Revisions: 1390-1-A
MSDS Effective Date: 9/14/90

2 - IDENTIFICATION

CHEM NAME & SYNS: Sodium Hydroxide Liquid; Soda Lye solution; Sodium Hydrate
TRADE NAME: Caustic Soda Liquid 25%
CHEMICAL FAMILY: Alkali
FORMULA: NaOH

3 - PHYSICAL DATA

BOILING POINT: 230 to 240 deg. F
FREEZING POINT: 5F
MELTING POINT:
SPECIFIC GRAVITY: 1.278 @ 60F (H2O=1)
VAPOR PRESSURE:
VAPOR DENSITY: N.A.
SOLUBILITY IN WATER, % BY WT: Complete
PERCENT VOLATILES BY VOLUME: ~50%
EVAPORATION RATE: Will not evap.

APPEARANCE AND ODOR: Colorless viscous liquid. No odor.
pH 14

4 - INGREDIENTS

MATERIAL	%	TLV
Caustic Soda Liquid CAS # 1310-73-2	25	*See below

4 - INGREDIENTS (continued)

----------EXPOSURE LIMIT INFORMATION----------

Reacts violently with acids.
Reacts with aluminum, tin, zinc, & generates flammable Hydrogen gas.
Corrosive to all human and animal tissue.
Ceiling limit: 2 mg/m3 ACGIH NIOSH TLV: 2 mg/m3, 15 min. ceiling.

----------REGULATORY DATA----------

Toxic Substances Control Act - This substance is listed on the Toxic Substance Control Act Chemical Substance Inventory 1985 Edition Volume 1.
Emergency planning and community right-to-know, per 40 CFR, 355 Appendix A,
threshold planning quantity - none established.
Supplier notification requirements, per 40 CFR 372.45.
This product or misture contains a toxic chemical or chemicals subject to the reporting requirements of section 313 of title III of the superfund amendment and reauthorization act of 1986.
Comprehensive response, compensation and liability act (CERCLA) this product is subject to CERCLA reporting requirements.

N.F.P.A. REGISTRY: 3-0-1

5 - FIRE AND EXPLOSION DATA

FLASH POINT & METHOD USED: None - Non-combustible

---------FLAMMABLE LIMITS--------
LOWER: N/A UPPER: N/A

EXTINGUISHING MEDIA: Suitable for surrounding fire

SPECIAL FIRE FIGHTING PROCEDURES: Can cause spattering by reaction with water - wear clothing to avoid body contact.

UNUSUAL FIRE & EXPLOSION HAZARDS: Reacts violently with hydrogen peroxide and acids. This material is corrosive to all human tissue. It will react violently with many organic chemicals, especially nitrocarbons and chlorocarbons. Caustic soda reacts with zinc, aluminum, tin and other active metals liberating flammable hydrogen gas.

6 - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE:
INHALATION: Sore throat, coughing, shortness of breath
SKIN: Corrosive, serious chemical and/or thermal burns.

6 - HEALTH HAZARD DATA (continued)

EYES: Corrosive to permanent injury (blindness)
INGESTION: Corrosive, spasms, vomiting, tissue destruction, possible death.
LD 50 for mice = mg/kg, oral LDLo for rabbits = 500 mg/kg

FIRST FIRST AID PROCEDURES:
INHALATION: Remove from exposure, get medical help.
SKIN: Remove contaminated clothing, wash with water. Rabbit 50 mg/24 hour severe irritation.
EYES: Flush with water for 15 minutes including under the eyelids. Get medical help. Rabbit 0.05 mg/24 hour severe irritation.
INGESTION: Drink plenty of water or fruit juice. Get immediate medical help. A simple water rinse is not adequate to remove this product from skin - continue to water flush until slipperiness is gone.
TARGET ORGANS: Eyes, respiratory system, skin

NOTES TO PHYSICIAN:

7 - REACTIVITY DATA

--STABILITY--	CONDITIONS	Avoid contact with acids & metals like
STABLE: X	TO	aluminum, tin, zinc.
UNSTABLE:	AVOID:	
INCOMPATIBILITY (MATERIALS TO AVOID):		Organic Chemicals
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS:		Flammable hydrogen gas may be generated when NaOH and certain metals react.
HAZARDOUS POLYMERIZATION:		Exposure to air can form Sodium carbonate. Trichlorethylene will react to form
MAY OCCUR:	CONDITIONS	dichloracetylene which is spontaneously
WILL NOT OCCUR: X	TO AVOID:	flammable.

8 - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF
MATERIAL IS RELEASED
OR SPILLED: Protective clothing and equipment must be worn by clean-up personnel. Contain spillage or leaking in suitable container or contain in a holding area. A temporary holding area may be formed with an earthen dike

8 - SPILL OR LEAK PROCEDURES (continued)

system. Do not allow drainage to sewers, streams or storm conduits. Recover with vacuum equipment such as a septic tank truck or neutralize with weak acid solutions and flush with water. Avoid splashing or misting which could increase health hazards.

WASTE DISPOSAL METHODS: Dispose of spillage waste per company contingency plan and in accordance with federal, state and local regulations. Neutralized waste is composed of salt and water. Reportable spillage quantity is 1000 lbs. or 454 kg. Planning ahead is essential for handling spills. Proper equipment and trained employees should be readily available to correct a spill situation.

9 - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:	None normally required however if "misting" or heavy vapor formation occurs, a NIOSH approved mist respirator should be worn.
VENTILATION:	Provide adequate ventilation to meet TLV requirements.
PROTECTIVE GLOVES:	Rubber, latex, plastic. DO NOT use leather or wool.
OTHER PROTECTIVE EQUIPMENT:	Safety eye wash/shower stations must be available in work area. Rubber boots. Rubbers over leather shoes NOT recommended. Rubber apron, rainwear or disposable Tyvek suit with hard hat should be worn.

10 - SPECIAL HANDLING INFORMATION

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

HYGIENIC: Eye & skin protective equipment must be worn. Safety showers with eye baths should be available in storage areas. Storage tank should be contained in a diked area that has sufficient capacity to hold contents of tank. This area should be free of potential contact with acids, organics & reactive metals.

PRECAUTIONS FOR REPAIR & MAINTENANCE OF CONTAMINATED EQUIPMENT: Thoroughly wash with water and check pH for neutrality prior to work.

10 - SPECIAL HANDLING INFORMATION (continued)

OTHER PRECAUTIONS

When mixing the caustic soda with water, always add the caustic slowly and continuously to the water, while stirring to minimize spattering from localized heat of dilution. DO NOT add water to the caustic.

11 - FURTHER INFORMATION

THIS MATERIAL SAFETY DATA SHEET IS OFFERED SOLELY FOR YOUR INFORMATION, CONSIDERATION AND INVESTIGATION.

W. H. SHURTLEFF PROVIDES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, AND ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE DATA CONTAINED HEREIN.

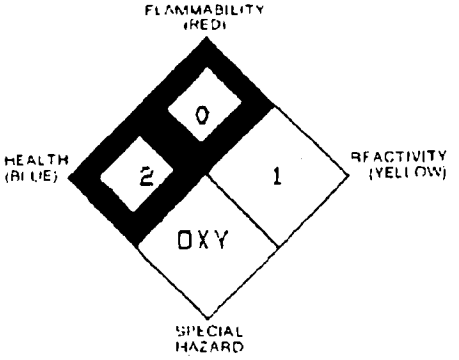
FMC

MATERIAL SAFETY DATA 7722 84 1 50

NFPA Designation 704

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

DEGREE OF HAZARD
4 EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT



EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

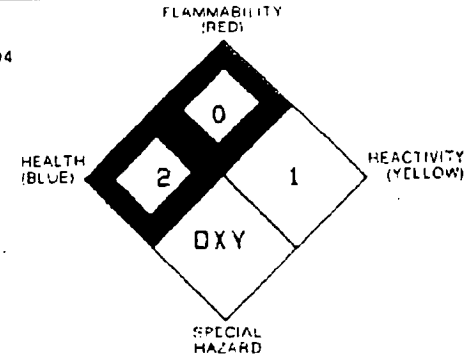
REVISION:	EFFECTIVE: 01/29/92 PRINTED: 02/23/93
PREPARED FOR USE BY.....	MARCY WH SHURTLEFF
==========	IDENTIFICATION ==========
INFORMATION PROVIDED BY..:	PEROXYGEN CHEMICALS DIVISION FMC CORPORATION 1735 MARKET STREET PHILADELPHIA, PA. 19103 (215) 299-6000
==========	CONTENTS ==========
	LATEST REVISIONS NOTED IN BOLD PRINT FOR 30 DAYS FROM DATE OF REVISION. ADDITIONAL TECHNICAL DATA AT END OF MSDS.
==========	PRODUCT INFORMATION ==========
SYNONYMS.....:	HYDROGEN PEROXIDE 40%-50%
SHIPPING NAME - DOT.....:	HYDROGEN PEROXIDE SOLUTION (40%-50%) OXIDIZER
IATA.....:	HYDROGEN PEROXIDE SOLUTION (40%-50%) OXIDIZER
IMDG.....:	HYDROGEN PEROXIDE SOLUTION (40%-50%) OXIDIZER
FORMULA.....:	H202
CHEMICAL FAMILY.....:	PEROXYGEN
PRODUCT USES.....:	STANDARD GRADE: H202 IS SPECIALLY FORMULATED WITH AN INORGANIC TIN-BASED STABILIZER SYSTEM FOR HIGH STABILITY AND LONG-TERM STORAGE. STANDARD GRADE H202 IS THE MOST SUITABLE GRADE AVAILABLE FOR INDUSTRIAL PURPOSES. TECHNICAL GRADE: H202 CONTAINS AN ORGANIC-BASED STABILIZER SYSTEM. IT IS PRODUCED FOR THOSE CUSTOMERS WHO NEED A PRODUCT ESSENTIALLY FREE OF INORGANIC METAL IONS. IT IS PARTICULARLY USEFUL IN CHEMICAL SYNTHESIS WHERE THE PRESENCE OF AN INORGANIC RESIDUE MAY BE OBJECTIONABLE.

FMC

MATERIAL SAFETY DATA 7722 84 1 50

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

NFPA Designation 704



DEGREE OF HAZARD
4 EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT

EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

REVISION: EFFECTIVE: 01/29/92 PRINTED: 02/23/93

==========	PRECAUTIONARY INFORMATION ==========
PRECAUTIONARY STATEMENT..: (PLEASE USE THIS STATEMENT TO SATISFY THE IN-PLANT LABELING REQUIREMENTS OF THE OSHA HAZARD COMMUNICATIONS STANDARD 29CFR 1910.1200)	HEALTH: LIQUID IS CORROSIVE TO THE EYE AND SKIN. DIRECT EYE CONTACT MAY CAUSE IRREVERSIBLE TISSUE DAMAGE INCLUDING BLINDNESS. INHALATION OF MIST OR VAPOR WILL CAUSE SEVERE IRRITATION OF LUNGS, THROAT AND NOSE THAT USUALLY SUBSIDES AFTER EXPOSURE CEASES. SWALLOWING MAY PRODUCE CORROSION (BURNING) OF THE GASTROINTESTINAL TRACT THAT MAY BE LIFE-THREATENING. PHYSICAL: INITIATES COMBUSTION IN OTHER MATERIALS BY CAUSING FIRE THROUGH RELEASE OF OXYGEN.
==========	INGREDIENTS ==========
CAS# AND COMPONENT.....:	MATERIAL/COMPONENT: HYDROGEN PEROXIDE PERCENT.....: 40%-50% CAS # .....: 7722-84-1 HAZARD CLASS.....: OXIDIZER MATERIAL/COMPONENT: WATER PERCENT.....: 50%-60% CAS#.....: 7732-18-5
CANADIAN PRODUCT IDENTIFICATION NUMBER....:	2014

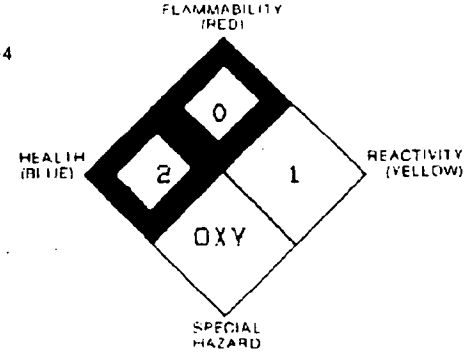
FMC

MATERIAL SAFETY DATA 7722 84 1 50

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

NFPA Designation 704

DEGREE OF HAZARD
4 EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT



EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

REVISION: EFFECTIVE: 01/29/92 PRINTED: 02/23/93

==========	PHYSICAL DATA ==========
MELTING/FREEZING POINT...:	40% -41.4*C(-42.5*F) 50% -52*C(-62*F)
BOILING POINT.....:	40% 110*C(229*F) 50% 114*C(237*F)
VAPOR PRESSURE.....:	40% 22 MM HG @ 30*C 50% 18.3 MM HG @ 30*C
VAPOR DENSITY (AIR = 1)..:	UNKNOWN
ROOM TEMPERATURE APPEARANCE AND STATE:	CLEAR, COLORLESS LIQUID
ODOR.....:	ODORLESS
SPECIFIC GRAVITY (H2O =1):	40% 1.15 @ 20*C/4*C 50% 1.19 @ 20*C/4*C
SOLUBILITY IN H2O % BY WT:	100%
% VOLATILES BY VOLUME....:	100%
EVAPORATION RATE (BUTYL ACETATE = 1).:	ABOVE 1
PH (AS IS).....:	40% 1.2-2.2 50% 1.0-3.0
PH (1% SOLUTION).....:	40% 5.0-6.0 50% 5.0-6.0
ODOR THRESHOLD.....:	NOT AVAILABLE
DENSITY (GMS/ML).....:	40% 1.15 @ 20*C 50% 1.19 @ 20*C
COEFF. WATER/OIL DIST....:	NOT AVAILABLE
==========	FIRE, EXPLOSION AND REACTIVITY DATA ==========
FLASH POINT.....:	NON-COMBUSTIBLE
AUTOIGNITION TEMPERATURE.:	NON-COMBUSTIBLE
FLAMMABLE LIMITS UPPER..:	NON-COMBUSTIBLE
(AIR) LOWER..:	NON-COMBUSTIBLE
EXTINGUISHING MEDIA.....:	WATER, WATER FOG, CO2, DRY CHEMICAL
SPECIAL FIREFIGHTING PROCEDURES.....:	ANY TANK OR CONTAINER SURROUNDED BY FIRE SHOULD BE FLOODED WITH WATER FOR COOLING. IF HYDROGEN PEROXIDE IS LEAKING, WEAR FULL PROTECTIVE CLOTHING AND NIOSH CERTIFIED BREATHING APPARATUS (SCBA).
DEGREE OF FIRE AND EXPLOSION HAZARD.....:	HYDROGEN PEROXIDE ITSELF IS NONCOMBUSTIBLE. ON DECOMPOSITION RELEASES OXYGEN WHICH MAY INTENSIFY FIRE. HYDROGEN PEROXIDE VAPORS AND MISTS ARE EXTREMELY IRRITATING TO EYES AND SKIN.
STABILITY.....:	UNSTABLE
HAZARDOUS POLYMERIZATION.:	WILL NOT OCCUR
CONDITIONS TO AVOID.....:	EXCESSIVE HEAT, CONTAMINATION OF ANY KIND.

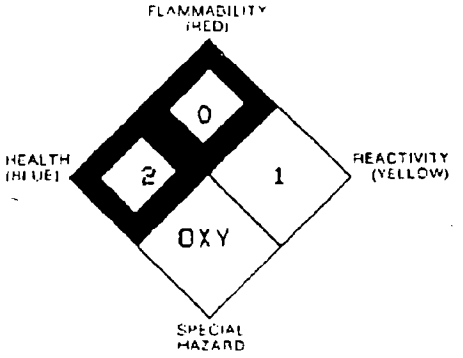
FMC

MATERIAL SAFETY DATA 7722 84 1 50

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

NFPA Designation 704

DEGREE OF HAZARD
4 - EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT



EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

REVISION: EFFECTIVE: 01/29/92 PRINTED: 02/23/93

FIRE, EXPLOSION AND REACTIVITY DATA

MAJOR CONTAMINANTS THAT CONTRIBUTE TO INSTABILITY	IRON AND OTHER HEAVY METALS, GALVANIZED IRON. COPPER ALLOYS, RUST, DIRT, ORGANIC AND COMBUSTIBLES.
INCOMPATIBILITY	REDUCING AGENTS, WOOD, PAPER AND OTHER COMBUSTIBLES. IRON AND OTHER HEAVY METALS AS LISTED ABOVE.
HAZARDOUS DECOMPOSITION PRODUCTS	OXYGEN WHICH SUPPORTS COMBUSTION.
SENSITIVITY TO MECH IMPACT	NOT AVAILABLE
SENSITIVITY TO STATIC DISCHARGE	NOT AVAILABLE

ROUTES OF EXPOSURE

		SOURCE	DATE
EYE CONTACT	CORROSIVE (RABBIT) REF. ICG/T-79.027	FMC	1979
SKIN CONTACT	SEVERE IRRITANT (RABBIT) REF. I89-1079	FMC	1989
SKIN ABSORPTION	PRACTICALLY NON-TOXIC LD50 >6.5 G/KG (FOR 70% H202) (RABBIT) REF. ICG/T-79.027	FMC	1979
INHALATION	LC50 >0.17 MG/L (RAT) REF: I89-1080	FMC	1989
INGESTION	TOXIC LD50 >225 MG/KG AND <1200 MG/KG REF. I86-914	FMC	1986

EXPOSURE LIMITS

	SOURCE	DATE
TLV = 1 PPM (1.5M G/M3) TWA	ACGIH	1991
PEL = 1 PPM TWA	OSHA 1910.1000	1990

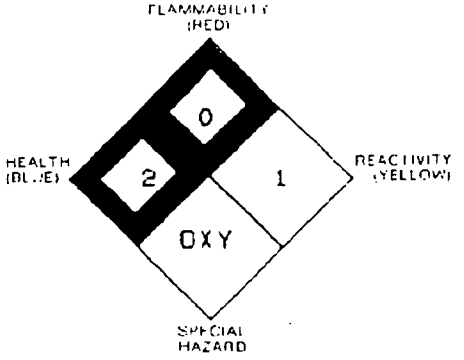
FMC

MATERIAL SAFETY DATA 7722 84 1 50

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

NFPA Designation 704

DEGREE OF HAZARD
4 EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT



EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

REVISION: EFFECTIVE: 01/29/92 PRINTED: 02/23/93

==========	EFFECTS OF OVEREXPOSURE ==========
ACUTE EXPOSURE.....:	CORROSIVE TO EYES AND GASTROINTESTINAL TRACT. MAY CAUSE IRREVERSIBLE TISSUE DAMAGE TO THE EYES, INCLUDING BLINDNESS. SEVERELY IRRITATING TO SKIN, NOSE, THROAT AND LUNGS.
CHRONIC EXPOSURE.....: (EFFECTS CONSIDERED INCLUDE: SENSITIVITIES, CARCINOGENICITY, TERATOGENICITY, MUTAGENICITY, SYNERGISTIC PRODUCTS, AND ANY MEDICAL CONDITIONS GENERALLY RECOGNIZED AS BEING AGGRAVATED BY EXPOSURE.)	THERE ARE REPORTS OF LIMITED EVIDENCE OF CARCINOGENICITY OF HYDROGEN PEROXIDE TO MICE ADMINISTERED HIGH CONCENTRATIONS IN THEIR DRINKING WATER (IARC MONOGRAPH 36, 1985). HOWEVER THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER CONCLUDED THAT HYDROGEN PEROXIDE COULD NOT BE CLASSIFIED AS TO ITS CARCINOGENICITY TO HUMANS (GROUP III CARCINOGEN). ACCORDINGLY, THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) DOES NOT REQUIRE THAT HYDROGEN PEROXIDE BE IDENTIFIED AS A CARCINOGEN. SENSITIVITIES, TERATOGENICITY, MUTAGENICITY, SYNERGISTIC PRODUCTS, REPRODUCTIVE TOXICITY, AND ANY MEDICAL CONDITIONS GENERALLY RECOGNIZED AS BEING AGGRAVATED BY EXPOSURE WERE EXAMINED AND NO INFORMATION WAS FOUND OR IS AVAILABLE.
==========	EMERGENCY AND FIRST AID PROCEDURES ==========
EYES.....:	IMMEDIATELY FLUSH WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES, LIFTING UPPER AND LOWER LIDS INTERMITTENTLY. SEE AN OPHTHALMOLOGIST.
SKIN.....:	WASH WITH LARGE AMOUNTS OF WATER. IF IRRITATION OCCURS, SEE A PHYSICIAN.
INHALATION.....:	REMOVE TO FRESH AIR. CALL A PHYSICIAN.
INGESTION.....:	IF SWALLOWED, DRINK PLENTY OF WATER IMMEDIATELY TO DILUTE. DO NOT INDUCE VOMITING. SEE A PHYSICIAN.
DECONTAMINATION PROCEDURE:	WASH AREA WITH LARGE AMOUNTS OF WATER.

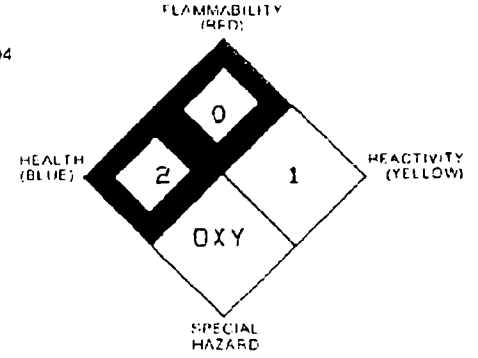
FMC

MATERIAL SAFETY DATA 7722 84 1 50

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

NFPA Designation 704

DEGREE OF HAZARD
4 EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT



EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

REVISION: EFFECTIVE: 01/29/93 PRINTED: 02/23/93

EMERGENCY AND FIRST AID PROCEDURES

NOTES TO PHYSICIAN.....: HYDROGEN PEROXIDE AT THESE CONCENTRATIONS IS A STRONG OXIDANT. DIRECT CONTACT WITH THE EYE IS SUFFICIENTLY LIKELY TO CAUSE CORNEAL DAMAGE, ESPECALLY IF NOT WASHED AWAY IMMEDIATELY SO THAT CAREFUL OPHTHALMOLOGIC EVALUATION IS RECOMMENDED AND THE POSSIBILITY OF LOCAL CORTICOSTEROID THERAPY SHOULD BE CONSIDERED. BECAUSE OF THE LIKELIHOOD OF CORROSIVE EFFECTS ON THE GASTRO-INTESTINAL TRACT AFTER INGESTION, AND THE UN-LIKELIHOOD OF SYSTEMIC EFFECTS, ATTEMPTS AT EVACUATING THE STOMACH VIA EMESIS INDUCTION OR GASTRIC LAVAGE SHOULD BE AVOIDED. THERE IS A RE-MOTE POSSIBILITY, HOWEVER, THAT A NASOGASTRIC OR ORDGASTRIC TUBE MAY BE REQUIRED FOR THE REDUC-TION OF SEVERE DISTENSION DUE TO GAS FORMATION.

SPECIAL PROTECTION

VENTILATION REQUIREMENTS.: PROVIDE GENERAL AND LOCAL EXHAUST VENTILA-TION AS NECESSARY. CONTROL MISTS IN WORKPLACE AT OR BELOW EXPOSURE GUIDELINES (TLV 1PPM FOR 8 HRS.)

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY.....: FOR SEVERE VAPOR OR MIST (CONCENTRATION IN EXCESS OF 10 PPM) USE NIOSH CERTIFIED SELF-CONTAINED BREATHING APPARATUS. DO NOT USE ANY OXIDIZABLE SORBANTS.

EYES.....: CUP TYPE CHEMICAL GOGGLES REQUIRED. FULL FACE MASK OPTIONAL.

GLOVES.....: LIQUID PROOF RUBBER OR NEOPRENE GLOVES.

SPECIAL CLOTHING AND EQUIPMENT..: POLYESTER OR ACRYLIC FULL COVER CLOTHING.

FOOTWEAR.....: RUBBER OR NEOPRENE FOOTWEAR.

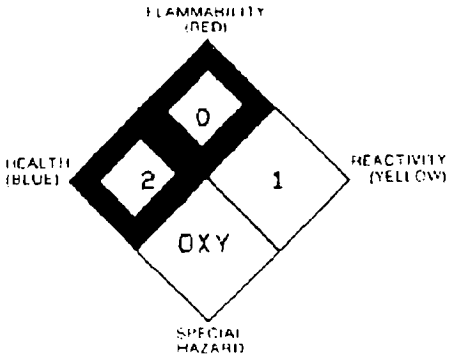
FMC

MATERIAL SAFETY DATA 7722 84 1 50

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

NFPA Designation 704

DEGREE OF HAZARD
4 EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT



EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

REVISION: EFFECTIVE: 01/29/92 PRINTED: 02/23/93

==========	STORAGE AND HANDLING ==========
(PLEASE USE THIS STATEMENT TO SATISTY THE IN-PLANT LABELING REQUIREMENTS OF THE OSHA HAZARD COMMUNICATIONS STANDARD 29CFR 1910.1200)	WEAR CUP TYPE CHEMICAL SAFETY GOGGLES, POLYESTER OR ACRYLIC FULL COVER CLOTHING AND RUBBER OR NEOPRENE GLOVES AND SHOES. AVOID EXCESSIVE HEAT. AVOID CONTAMINATION OF ANY KIND. CONTAMINATION MAY CAUSE DECOMPOSITION AND GENERATION OF OXYGEN GAS WHICH COULD RESULT IN HIGH PRESSURES AND POSSIBLE CONTAINER RUPTURE. HYDROGEN PEROXIDE SHOULD NOT BE STORED IN AN UNVENTED CONTAINER AND SHOULD BE TRANSFERRED ONLY IN A PRESCRIBED MANNER (SEE FMC TECHNICAL BULLETINS). NEVER RETURN UNUSED HYDROGEN PEROXIDE TO ORIGINAL CONTAINER. EMPTY DRUMS SHOULD BE RINSED WITH WATER BEFORE DISCARDING. UTENSILS USED FOR HANDLING HYDROGEN PEROXIDE SHOULD BE MADE ONLY OF THE FOLLOWING COMPATIBLE MATERIALS: GLASS, STAINLESS STEEL, ALUMINUM OR PLASTIC. STORAGE SHOULD CONFORM TO CONDITIONS DESCRIBED IN NFPA BULLETIN 43A (CODE FOR THE STORAGE OF LIQUID AND SOLID OXIDIZING MATERIALS). NFPA HAZARD CLASS II OXIDIZER.
==========	DISPOSAL, SPILL OR LEAK PROCEDURES ==========
PROCEDURE FOR RELEASE.... OR SPILL	DILUTE WITH A LARGE VOLUME OF WATER AND HOLD IN A POND OR DIKED AREA UNTIL THE H202 DECOMPOSES. DISPOSE OF ACCORDING TO THE METHODS OUTLINED BELOW FOR WASTE DISPOSAL.
WASTE DISPOSAL METHOD....	AN ACCEPTABLE METHOD OF DISPOSAL IS TO DILUTE WITH A LARGE AMOUNT OF WATER AND ALLOW THE HYDROGEN PEROXIDE TO DECOMPOSE FOLLOWED BY DISCHARGE INTO A SUITABLE TREATMENT SYSTEM IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL ENVIRONMENTAL LAWS, RULES, REGULATIONS, STANDARDS AND OTHER REQUIREMENTS. BECAUSE ACCEPTABLE METHODS OF DISPOSAL MAY VARY BY LOCATION AND BECAUSE REGULATORY REQUIREMENTS MAY CHANGE, THE APPROPRIATE REGULATORY AGENCIES SHOULD BE CONTACTED PRIOR TO DISPOSAL.

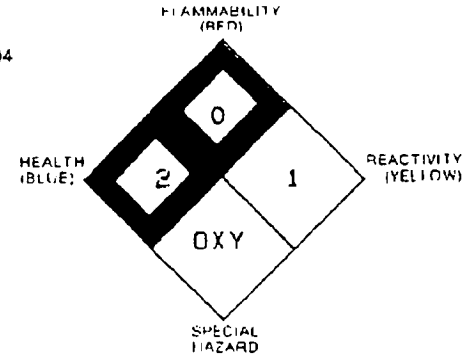
FMC

MATERIAL SAFETY DATA 7722 84 1 50

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

NFPA Designation 704

DEGREE OF HAZARD
4 EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT



EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

REVISION: EFFECTIVE: 01/29/92 PRINTED: 02/23/93

==========	TRANSPORTATION DATA ==========
DOT PROPER SHIPPING NAME.:	HYDROGEN PEROXIDE SOLUTION 40%-50%
DOT CLASSIFICATION.....:	OXIDIZER
DOT LABELS.....:	OXIDIZER
DOT MARKING.....:	HYDROGEN PEROXIDE SOLUTIONS 40%-50% UN NO 2014
DOT PLACARD.....:	OXIDIZER (NOT REQUIRED FOR SHIPMENTS IN BULK QUANTITIES. REF. CFR 49 173.266, E)
UN NUMBER.....:	2014
HAZARDOUS SUBSTANCE/RQ...:	NOT LISTED
49 STCC NUMBER.....:	4918775
EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURE:	KEEP PEOPLE AWAY. WEAR FULL PROTECTIVE CLOTHING. USE WATER ONLY FOR FIRE.
PRECAUTIONS TO BE TAKEN..: IN TRANSPORTATION	PROTECT FROM PHYSICAL DAMAGE. DRUMS SHOULD NOT BE STACKED DURING TRANSIT. KEEP DRUMS IN UP-RIGHT POSITION.
TYPE PACKAGES.....:	POLYETHYLENE CONTAINERS/DOT 34
OTHER SHIPPING IDS.....:	
==========	ADDITIONAL REGULATORY INFORMATION ==========
MATERIAL IS REPORTED IN EPA TSCA INVENTORY LIST?	YES
MATERIAL IS LISTED AS A CARCINOGEN/POTENTIAL CARCINOGEN IN FOLLOWING	
NTP ANNUAL REPORT... ?	NO
IARC GROUP I OR II...?	NO
OSHA 29CFR PART 1910 SUBPART Z ?	NO
ACGIH APPENDIX A.....?	NO
DOES PRODUCT CONTAIN A TOXIC CHEMICAL(S) SUBJECT TO SARA TITLE III SECTION 313 REPORTING.....	NO
CHEMICAL(S).....:	THESE PRODUCTS DO NOT CONTAIN ANY TOXIC CHEMICALS IN QUANTITIES SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 TITLE III OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA) AND 40 CFR PART 372.

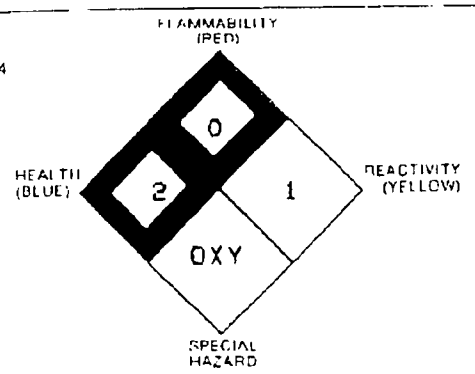
FMC

MATERIAL SAFETY DATA 7722 84 1 50

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

NFPA Designation 704

DEGREE OF HAZARD
4 EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT



EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

REVISION: EFFECTIVE: 01/29/92 PRINTED: 02/23/93

========== ADDITIONAL REGULATORY INFORMATION ==========

SARA TITLE III SECTION 311/312 CLASSIFICATION...:

IMMEDIATE (ACUTE) HEALTH HAZARD.
FIRE HAZARD.

==========

PROPOSITION 65 - CALIFORNIA
SAFE DRINKING WATER AND TOXICS ENFORCEMENT ACT OF 1986 (PROPOSITION 65) - CALIFORNIA. THIS ACT REQUIRES THAT THE GOVERNMENT OF CALIFORNIA DEVELOP A LIST OF CARCINOGENS AND REPRODUCTIVE TOXINS AND THAT NO PERSONS DOING BUSINESS SHALL KNOWINGLY EXPOSE ANY INDIVIDUAL TO A CHEMICAL KNOWN TO THE STATE TO CAUSE CANCER OR REPRODUCTIVE TOXICITY WITHOUT FIRST GIVING CLEAR AND REASONABLE WARNING TO SUCH AN INDIVIDUAL.
FMC WOULD LIKE YOU TO KNOW THAT OUR 70% HYDROGEN PEROXIDE CONTAINS THE INDICATED CONCENTRATION(S) OF CHEMICALS WHICH ARE LISTED BY CALIFORNIA AS CHEMICALS KNOW TO CAUSE CANCER(A), REPRODUCTIVE TOXICITY(B) OR BOTH OF THESE EFFECTS(C).

CHEMICAL	CONCENTRATION (PPM, PPB, % ETC)	LISTED AS: (A), (B), (C)
ARSENIC	EQUAL TO/LESS THAN 0.1 PPM	(A)
CADMIUM	EQUAL TO/LESS THAN 0.1 PPM	(A)
CHROMIUM	EQUAL TO/LESS THAN 0.2 PPM	(A)
LEAD	EQUAL TO/LESS THAN 0.5 PPM	(B)

NOTE:
PERCENTAGES LESS THAN 70% HYDROGEN PEROXIDE WOULD CONTAIN PROPORTIONATELY LESS CONCENTRATION OF THE CHEMICALS IDENTIFIED.

========== ADDITIONAL INFORMATION ==========

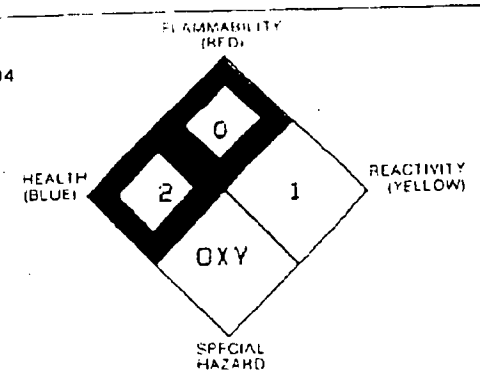
FMC

MATERIAL SAFETY DATA 7722 84 1 50

NFPA Designation 704

HYDROGEN PEROXIDE 40%-50%
STANDARD & TECHNICAL GRADE

DEGREE OF HAZARD
4 EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNIFICANT



EMERGENCY TELEPHONE NOS:
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (609) 924-6677 CALL COLLECT

REVISION: EFFECTIVE: 01/29/92 PRINTED: 02/23/93

========== ADDITIONAL TECHNICAL DATA ==========

SUGGESTED USES.....:
STANDARD GRADE HYDROGEN PEROXIDE IS SPECIALLY FORMULATED WITH AN INORGANIC TIN-BASED STABILIZER SYSTEM FOR HIGH STABILITY AND LONG-TERM STORAGE.
STANDARD GRADE HYDROGEN PEROXIDE IS THE MOST SUITABLE GRADE AVAILABLE FOR INDUSTRIAL PURPOSES.
TECHNICAL GRADE HYDROGEN PEROXIDE CONTAINS AN ORGANIC-BASED STABILIZER SYSTEM. IT IS PRODUCED FOR THOSE CUSTOMERS WHO NEED A PRODUCT ESSENTIALLY FREE OF INORGANIC METAL IONS. IT IS PARTICULARLY USEFUL IN CHEMICAL SYNTHESIS WHERE THE PRESENCE OF AN INORGANIC RESIDUE MAY BE OBJECTIONABLE.

TYPICAL ANALYSIS.....:

ACTIVE OXYGEN CONTENT, %	18.8 - 23.5
SPECIFIC GRAVITY (20*C/4*C)	1.15 - 1.19
LBS/GAL(KG/M3 OR G/L)@20*	9.59(1150)-9.92(1190)
STABILITY, 24 HOURS @ 100*C	96% MIN

SPECIFICATIONS.....:

ADDITIONAL INFORMATION...:
THE FOLLOWING EXAMPLES OF FMC BULLETINS, AVAILABLE ON REQUEST, PROVIDE DETAILED INFORMATION ON PROPERTIES, HANDLING, SAFETY AND SUGGESTED USES OF HYDROGEN PEROXIDE:
- "HYDROGEN PEROXIDE", TECHNICAL BULLETIN
- "STORAGE EQUIPMENT FOR BULK SHIPMENTS OF HYDROGEN PEROXIDE",
- "THE ANALYSIS OF HYDROGEN PEROXIDE SOLUTIONS",
- "INDUSTRIAL WASTE TREATMENT WITH HYDROGEN PEROXIDE",

Post-it' Fax Note 7672

TIM BAKER

No of Pages | Today's Date | Time

From

Company

Location | Dept. Charge

Fax # | Telephone #

Original Disposition: ☐ Destroy ☐ Return ☐ Call for pickup

Location

Fax #

Comments

Telephone #

General Alum & Chemical Corporation

P.O. Box 436 • Kidder Point Road • Searsport, Maine 04974-0436
207-548-2525 • FAX 207-548-2891

MATERIAL SAFETY DATA SHEET

Emergency Telephone Nos.
New England: (207) 548-2525
Great Lakes: (419) 865-8000
Chemtrec: (800) 424-9300

Date issued: January 1995

I. Product Identification

Product Name: GEN FLOC - F61740

Chemical Description: Copolymer of Acrylamide and Sodium Acrylate

Product Class:

II. Hazardous Ingredients

Chemical Name: Cas No.25085-02-3
CoPolymer of Acrylamide and Sodium Acrylate

Wt%: N/A.

Hazard Communication Status: Not considered hazardous.

III. Typical Physical Properties

Boiling Point: N/A

Solubility in water: 10 g/l (% by w ight)

Vapor Pressure: N/A

Bulk Density: 49.9lb/cuft

Vapor Density: N/A

% Volatile by Wt.: N.D.

Appearance: White granular solid

IV. Fire and Explosion Hazard Data

Flash Point: N/A

Extinguishing Media: CO_2

Special Fire fighting Procedures: N/A

Unusual Fire and Explosion Hazards: N/A

V. Reactivity Data

Chemical stability: Stable

Hazardous Polymerization: Will not occur

Incompatibility: Strong oxidizers

Hazardous Decomposition Products: N/A

VI. Health Hazard Data

Acute Health Effects: None

VII. Applicable Control Measures

Personal Protective Equipment:

Eye Protection: Face shield, coveralls, chemical goggles.

Skin Protection: Water impermeable e.g. latex gloves.

Respiratory Protection: Under normal ventilation conditions, no respirator protection is required.

Handling and Storage Precautions: Do not get in eyes, on skin or clothing. Avoid breathing vapors. Wash thoroughly after handling.

Keep container closed. Use with adequate ventilation. GF 91740 is considered to be non-toxic.

VIII. First Aid

Eye Contact: Face shield, coveralls, chemical goggles.

Skin Contact: Water impermeable e.g. latex gloves.

Ingestion: If ingested, rinse mouth with water, dilute with water or milk. Do not give bicarbonate, do not induce vomiting.

Inhalation: Remove to fresh air. If difficulty in breathing seek medical attention.

IX. Spill or Leak Procedures/Waste Disposal

Do not get in eyes, on skin or clothing. Avoid breathing vapors. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. GF 91740 is considered to be non-toxic.

General Alum & Chemical Corporation

MATERIAL SAFETY DATA SHEET

Emergency Telephone Nos.

New England: (207) 548-2525
Great Lakes: (419) 865-8000
Chemtrec: (800) 424-9300

Date issued: January 1995

I. Product Identification

Product Name:GEN FLOC - F64140

Chemical Description: Cationic Acrylamide Copolymer Salt

II. Hazardous Ingredients

Chemical Name: Cationic Acrylamide Copolymer Salt

Cas No. 69418-26-4

Hazard Communication Status: Not considered hazardous.

III. Typical Physical Properties

Boiling Point: N/A

Vapor Pressure: N/A

Vapor Density: N/A

Solubility in water: 10 g/l (% by weight)

Bulk Density: 49.9 lb/cuft.

% Volatile by Weight: N.D.

Appearance and Odor: White granular solid

IV. Fire and Explosion Hazard Data

Flash Point: Not flammable

Extinguishing Media: Foam, Carbon Dioxide or dry chemical

Special Fire fighting Procedures: Wear self-contained breathing apparatus. Solutions of product are extremely slippery.

Unusual Fire and Explosion Hazards: Thermal decomposition expected to produce carbon monoxide, carbon dioxide, various nitrous oxides.

V. Reactivity Data

Chemical stability: Stable

Hazardous Polymerization: Will not occur

Incompatibility: Oxidizing agents - May cause exothermic reaction

Hazardous Decomposition Products: Thermal decomposition expected to produce carbon monoxide, carbon dioxide and various nitrous oxides.

VI. Health Hazard Data

Acute Health Effects: Inhalation: Dust may irritate respiratory tract. Ingestion: May cause discomfort or gastro intestinal disturbance. Low oral toxicity. Skin: May cause irritation, especially after prolonged or repeated contact.

Chronic Health Effects: None known

VII. Applicable Control Measures

Personal Protective Equipment:

Eye Protection: Safety glasses for normal handling conditions. Goggles when handling solutions. Do not wear contact lenses.

Skin Protection: Rubber gloves and full work clothing, and protective (rubber) clothing if splashing or repeated contact with solution likely.

Respiratory Protection: If dusty conditions are encountered, wear NIOSH approved dust respirator.

Handling and Storage Precautions: Avoid contact with skin, eye or clothing. Do not inhale dusts, use normal personal hygiene and housekeeping. Store in a cool, dry place.

VIII. First Aid

Eye Contact: Immediately flush with water, continuing for 15 min. get medical attention.

Skin Contact: Flush with plenty of soap and water for at least 15 min. If irritation persists get medical assistance.

Inhalation: Remove to fresh air.

Ingestion: If conscious, immediately give 2 to 4 glasses of water, and induce vomiting by (a) touching finger to bak of throat or (b) giving syrup of Ipecac (30ml).

IX. Spill or Leak Procedures/Waste Disposal

Wear personal protective equipment, sweep or shovel into metal or plastic container.

CAT. NO. 2449

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 16639

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sulfuric Acid Standard Solution 5.25 N
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00437

II. INGREDIENTS

Sulfuric Acid
PCT: <25
CAS NO.: 7664-93-9
SARA: LISTED
TLV: 1 mg/M3
PEL: 1 mg/M3
IARC: LISTED
HAZARD: Causes severe burns. Harmful if inhaled. Known carcinogen

Demineralized Water
PCT: to 100
CAS NO.: 7732-18-5
SARA: NOT LISTED
TLV: Not applicable
PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear and colorless ODOR: None
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: ND MELTING PT.: NA SPEC GRAVITY: 1.149 pH: <0.5
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.85 METAL CORROSIVITY - ALUMINUM: Corrosive
STEEL: 0.230 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: dry chemical. DO NOT USE WATER
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides in fire
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 2
NFPA Symbol: W
CONDITIONS TO AVOID: Contact with oxidizable materials, reducers, strong caustics, combustibles

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, skin and respiratory tract.
ACUTE TOXICITY: Slightly toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Teeth erosion, Chronic inflammation or irritation
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: teeth, lungs
CANCER INFORMATION: An ingredient of this mixture is a known carcinogen.
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: nasal cavity, paranasal sinus, lungs, larynx
OVEREXPOSURE: Severely burns any tissue contacted. Breathing in the mist or vapor may cause erosion of teeth, mouth soreness, difficulty in breathing. Inhalation of conc. sulfuric acid mist or vapor can cause cancer of the nasal tissue, lungs and larynx.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin and respiratory conditions

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: lab grade goggles, lab coat, rubber gloves, fume hood

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessa Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover the spill with excess soda ash or sod bicarbonate. Scoop slurry to beaker. Adjust pH to between 6 and 9. Flu to the drain with excess water. Wash site with an alkali solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN1830 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN2796 GROUP: II

I.M.O. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN2796 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 198
1989. American Conference of Governmental Industrial Hygienists, 198
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Januar
19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed
New York: Van Nostrand Reinhold Co. 1984.
6) IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, Wor
Health Organization (Volume 54) 1992, France.
7) NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards.
Cincinnati: Department of Health and Human Services, 1981.

SPECIAL NOTE: The IARC evaluation was based on exposure to the mist or va of concentrated sulfuric acid generated during chemical processes.

SARA: This product contains a chemical or chemicals subject to the report requirements of section 313 of Title III of the Superfund Amendments an Reauthorization Act of 1986 and 40 CFR Part 372.

Hach Company, WORLD HEADQUARTERS, PO Box 389, Loveland, CO 80539

Hach Europe, BP 229, B5000 Namur 1, BELGIUM

CAT. NO. 282

MATERIAL SAFETY DATA SHEET

POS: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Potassium Hydroxide Solution 8 N
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00216

II. INGREDIENTS

Potassium Hydroxide
PCT: <50 CAS NO.: 1310-58-3 SARA: NOT LISTED
TLV: 2 mg/M3 ceiling PEL: 2 mg/M3 ceiling
HAZARD: Very corrosive; very toxic

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear and colorless ODOR: Irritating
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: >100°C MELTING PT.: NA SPEC GRAVITY: 1.3 pH: 14
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.18 METAL CORROSIVITY - ALUMINUM: 21.311 in/yr
STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA EXTINGUISHING MEDIA: water
FIRE/EXPLOSION HAZARDS: Corrosive fumes may be given off
HAZARDOUS DECOMP. PRODUCTS: Contact with metals emits hydrogen gas
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Contact with acids, metals, explosives, organic peroxides and easily ignitable materials; extreme temperatures

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, skin and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: ingestion, inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Causes severe burns to all exposed tissue
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Chronic respiratory, eye and skin conditions

VI. PRECAUTIONARY MEASURES

Keep away from acids.
Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: fume hood, lab grade goggles, rubber gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessary. Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover spill with citric acid or another solid acidic material. Scoop slurry to beaker. Add water and neutralize liquid to a pH between 6 and 9. Flush neutralized waste to the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Potassium Hydroxide, Solution
HAZARD CLASS: 8 ID: UN1814 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Potassium Hydroxide Solution
HAZARD CLASS: 8 ID: UN1814 GROUP: II

I.M.O. PROPER SHIPPING NAME: Potassium Hydroxide, Solution
HAZARD CLASS: 8 ID: UN1814 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

CAT. NO. 424

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12968

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Buffer Solution Hardness 1
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00305

II. INGREDIENTS

Aminomethylpropanol
PCT: <60 CAS NO.: 124-68-5 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes eye and skin burns; moderately toxic

Acetic Acid
PCT: <10 CAS NO.: 64-19-7 SARA: NOT LISTED
TLV: 10 ppm PEL: 10 ppm
HAZARD: Corrosive

Other component
PCT: <0.1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, light yellow ODOR: Vinegar
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: 104.5°C MELTING PT.: NA SPEC GRAVITY: 1.035
pH: of 2% soln. = 10.0 VAPOR PRESSURE: Not determined
VAPOR DENSITY (air=1): ND EVAPORATION RATE: 0.36
METAL CORROSIVITY - ALUMINUM: ND STEEL: ~0.002 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: >97.2°C; >207°F METHOD: closed cup
FLAMMABILITY LIMITS - LOWER: ND UPPER: ND
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: May react with oxidizers; may emit toxic fumes in fire.
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of carbon monoxide and nitrogen oxides in fire.
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 1 Reactivity: 0
CONDITIONS TO AVOID: Heat, flames, oxidizers

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, irritating to skin.
ACUTE TOXICITY: Moderately toxic.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is an experimental mutagen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: May cause eye burns, skin irritation.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin and respiratory tract conditions.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Cal physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover the spill with excess soda ash or sodium bicarbonate. Scoop slurry to beaker. Adjust pH to between 6 and 9. Flush to the drain with excess water. Wash site with an alkali solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.
6) NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards. Cincinnati: Department of Health and Human Services, 1981.

CAT. NO. 444

MATERIAL SAFETY DATA SHEET

POB: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: SPADNS Reagent for Fluoride
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00481

II. INGREDIENTS

Hydrochloric Acid
PCT: <40 CAS NO.: 7647-01-0 SARA: LISTED
TLV: 5 ppm ceiling PEL: 5 ppm ceiling
HAZARD: Causes burns

Sodium Arsenite
PCT: <0.1 CAS NO.: 7784-46-5 SARA: LISTED
TLV: 0.2 mg/M3 as As PEL: 0.01 mg/M3 as As
IARC: LISTED NTP: LISTED
HAZARD: Extremely toxic; cancer hazard

Other components, each
PCT: <0.1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Dark red solution ODOR: Odorless
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: 105°C MELTING PT.: NA SPEC GRAVITY: 1.015 pH: <0.5
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.64 METAL CORROSIVITY - ALUMINUM: Corrosive
STEEL: 0.207 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes
HAZARDOUS DECOMP. PRODUCTS: Toxic fumes of arsenic and chlorides
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Extreme heat or flames; contact with strong oxidizers, acids, active metals such as iron, aluminum or zinc and alkalies.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, skin and respiratory tract.
ACUTE TOXICITY: Oral rat LD50 = 540 mg/Kg = Moderately toxic
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Causes burns; if swallowed, causes sedation, twitching
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Persons with impaired pulmonary function may be at increased risk from fumes.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessary. Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover the contaminated surface with sodium bicarbonate or a soda ash-slaked lime mixture (50-50). Mix and add water if necessary to form a slurry. Scoop up slurry and wash the site with soda ash solution. The neutralized slurry may contain sufficient heavy metal concentration to require landfilling or treatment at an EPA approved site.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Hydrochloric Acid, Solution
HAZARD CLASS: 8 ID: UN1789 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Hydrochloric Acid Solution
HAZARD CLASS: 8 ID: UN1789 GROUP: II

I.M.O. PROPER SHIPPING NAME: Hydrochloric Acid, Solution
HAZARD CLASS: 8 ID: UN1789 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Outside testing.
6) NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards. Cincinnati: Department of Health and Human Services, 1981.

SARA: This product contains a chemical or chemicals subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

PER CALIFORNIA PROPOSITION 65: "WARNING - This product contains a chemical known to the State of California to cause cancer."

CAT. NO. 767

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Potassium Cyanide
CAS NO.: 151-50-8 CHEMICAL NAME: Potassium Cyanide
FORMULA: KCN CHEMICAL FAMILY: Cyanides
MSDS NUMBER: M00264

II. INGREDIENTS

Potassium Cyanide
PCT: >96.5 CAS NO.: 151-50-8 SARA: LISTED
TLV: 5mg/m³ CN (skin) PEL: 5mg/m³ CN (skin)
HAZARD: Extremely toxic; fast-acting; experimental mutagen

Impurities
PCT: <3.5 CAS NO.: NA SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Toxicity unknown; may cause irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: White lumps ODOR: Bitter almonds
SOLUBILITY IN: WATER: Soluble ACID: Generates HCN
OTHER: Glycerol, methanol BOILING POINT: NA MELTING PT.: 634°C 1173°F
SPEC GRAVITY: 1.52 pH: 11.8 (0.1% sol'n) VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): 2.2 EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store tightly closed and protected from light.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: May emit very toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of cyanide and nitrogen oxides
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Strong oxidizers, acids, acid salts, alkaloids; extreme heat or flames; excess moisture.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Super toxic
ROUTES OF EXPOSURE: ingestion, inhalation
TARGET ORGANS: brain, central nervous system
CHRONIC TOXICITY: Extremely toxic
ROUTES OF EXPOSURE: ingestion, inhalation, skin absorption
TARGET ORGANS: central nervous system
CANCER INFORMATION: experimental mutagen
ROUTES OF EXPOSURE: ingestion
TARGET ORGANS: Not applicable
OVEREXPOSURE: May be rapidly fatal. Inhalation and ingestion may cause cyanosis. Symptoms may include headache, anxiety, confusion, irregular pulse, coma, death. Chronic skin contact may cause a 'cyanide' rash.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin or pulmonary disorders.

VI. PRECAUTIONARY MEASURES

Do not enter storage areas unless adequately ventilated.
Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
Protect from moisture
PROTECTIVE EQUIPMENT: lab grade goggles, lab coat, rubber gloves, fume hood

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Always have on hand a cyanide first aid kit. Break an amyl nitrite pearl in cloth and hold lightly under nose for 15 seconds. Repea every 5 minutes. Administer artificial respiration with 100% oxygen. Transport to hospital immediately.
INHALATION: Always have on hand a cyanide first-aid kit. Break an amyl nitrite pearl in cloth and hold lightly under nose for 15 seconds. Repea 5 times at 15-second intervals. Transport to hospital immediately.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Absorb spill on non-reactive material. Oxidize the waste with a 50% excess of a mixture of commercially available laundr bleach and soda ash or sodium bicarbonate. Allow to react in a well vente area for 24 hours. Drain liquid to sewer with a large excess of water, dispose of absorbant material as normal trash.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Potassium Cyanide
HAZARD CLASS: 6.1 ID: UN1680 GROUP: I

I.C.A.O. PROPER SHIPPING NAME: Potassium Cyanide
HAZARD CLASS: 6.1 ID: UN1680 GROUP: I

I.M.O. PROPER SHIPPING NAME: Potassium Cyanide, Solid
HAZARD CLASS: 6.1 ID: UN1680 GROUP: I

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.
4) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989
5) Technical judgment
6) NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards. Cincinnati: Department of Health and Human Services, 1981.
7) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
8) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984.
9) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U. S. Department of Health and Human Services, April, 1987
10) List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labelling of Dangerous Substances, Ammended November, 1986.

SPECIAL NOTE: A doctor's prescription is required for the purchase of amyl nitrite ampules. Contact your company doctor or local physician to obtain a prescription and determine where to purchase amyl nitrite ampules in your area.

SARA: This product contains a chemical or chemicals subject to the reportir requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

CAT. NO. 836

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12568

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Diphenylcarbazone Reagent
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00015

II. INGREDIENTS

Phthalic Acid
PCT: <75 CAS NO.: 88-99-3 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes eye irritation

Potassium Acid Phthalate
PCT: <35 CAS NO.: 877-24-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye and respiratory tract irritation

Sym-Diphenylcarbazone
PCT: <1 CAS NO.: 10329-15-4 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Toxicity unknown; may cause irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: Light yellow or pink ODOR: Not determined
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: NA MELTING PT.: 167°C SPEC GRAVITY: 1.40
pH: 3.1 (5% soln) VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water mist or spray
FIRE/EXPLOSION HAZARDS: May explode if heated to decomposition
HAZARDOUS DECOMP. PRODUCTS: May evolve phthalic anhydride which can be explosive
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 1 Reactivity: 1
CONDITIONS TO AVOID: Extreme temperatures; contact with sodium nitrite or nitric acid

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Not determined
ROUTES OF EXPOSURE: ingestion, inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Causes eye irritation. May be irritating to skin and respiratory tract; narcotic in high concentrations
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Persons with pre-existing eye, skin and respiratory conditions

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Call physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover contaminated surfaces with soda ash or sodium bicarbonate. Mix and add water if necessary. Use litmus paper to make sure pH of slurry is neutral or add neutralizer until mixture stops bubbling. Scoop up the slurry and wash the neutral waste down the drain with excess water. Wash the site with soda ash solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

CAT. NO. 851

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: MenVer # 2 Hardness Indicator
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M80884

II. INGREDIENTS

Sodium Chloride
PCT: <95 CAS NO.: 7647-14-5 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye irritation.

Hydroxylamine Hydrochloride
PCT: <10 CAS NO.: 5470-11-1 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Very toxic; causes severe eye and skin irritation

Silica, Fumed
PCT: <5 CAS NO.: 7631-86-9 SARA: NOT LISTED
TLV: 6 mg/M3 Tot dust PEL: 6 mg/M3 Tot dust
HAZARD: Irritating dust

Calmagite
PCT: <1 CAS NO.: 3147-14-6 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May be irritating to eyes and respiratory tract

Other components, each
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: Red crystalline powder ODOR: Not determined
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: ~151°C
SPEC GRAVITY: 2.12 pH: of 5% soln. = 3.3 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.045 in/yr STEEL: 0.102 in/yr
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: carbon dioxide, dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire.
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of hydrogen chloride and nitrogen oxides in fire.
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, flames; contact with lithium, bromine trifluoride, oxidizers or moisture

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: central nervous system, red blood cells
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is a potential carcinogen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: Causes eye irritation; may cause skin and respiratory tract irritation; may cause nausea, vomiting, convulsions, cyanosis, hypotension, coma, red blood cell damage. Chronic inhalation may cause a progressive lung disorder known as silicosis.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin and respiratory tract disorders; high blood pressure.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Cal physician. Wash skin with soap and plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air. Give artificial respiration if necessary. Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop spilled material into a beaker and dissolve with water. Neutralize to a pH between 6 and 9 with an alkali such as soda ash. Flush neutralized waste to the drain with an excess of water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984.
6) Casarett and Doull's Toxicology, 3rd Ed. New York: Macmillan Publishing Co., Inc. 1986.
7) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U. S. Department of Health and Human Services, April, 1987
8) Vendor information.

SPECIAL NOTE: In a laboratory test, single subcutaneous injections of sodiu chloride into pregnant mice at the level of 2500 mg/Kg caused fetal death and malformations. In a laboratory test, pregnant mice given a 2% sodium chloride solution in place of drinking water produced hypertensive adult offspring.

CAT. NO. 852

MATERIAL SAFETY DATA SHEET

POB: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: CalVer ® 2 Calcium Indicator
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00085

II. INGREDIENTS

Sodium Chloride
PCT: >95 CAS NO.: 7647-14-5 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye irritation.

Hydroxynaphthol Blue
PCT: <5 CAS NO.: 63451-35-4 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye and respiratory tract irritation

Other component
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: Deep blue crystals ODOR: Faint amine
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: 274C decomp.
SPEC GRAVITY: 2.13 pH: of 5% soln. = 7.9 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: None
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sodium oxide and chlorides in fire
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Excess exposure to air (carbon dioxide may make powder turn purple)

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes and skin.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is a potential carcinogen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: Causes moderate eye and mild skin irritation. Ingestion of sodium chloride in large amounts may produce dehydration, stomach irritation, vomiting, diarrhea, blood pressure problems, muscular twitching and rigidity, convulsions, collapse, death.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: Adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. C physician. Wash skin with soap and plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Sweep up powder. Avoid breathing material. Dissolve in water. Flush down the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U. S. Department of Health and Human Services, April, 198
6) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.
7) Casarett and Doull's Toxicology, 3rd Ed. New York: Macmillan Publishing Co., Inc. 1986.
8) Acta Anat. 74: 121-124 (1969)
9) Journal of Clinical Investigations 41: 710-714 (1962)

SPECIAL NOTE: In a laboratory test, single subcutaneous injection of sodiu chloride into pregnant mice at the level of 2500 mg/Kg caused fetal deat and malformations. In a labortory test, mice given a 2% sodium chloride solution in place of drinking water during pregnancy produced hypertensi adult offspring.

CAT. NO. 854

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 14666

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

PO#: 145069
HACH ORDER#: 979671

I. PRODUCT IDENTIFICATION

PRODUCT NAME: FerroVer ® Iron Reagent
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00155

II. INGREDIENTS

Sodium Thiosulfate, Anhydrous
PCT: <55 CAS NO.: 7772-98-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Sodium Metabisulfite
PCT: <30 CAS NO.: 7681-57-4 SARA: NOT LISTED
TLV: 5 mg/M3 PEL: 5 mg/M3
IARC: LISTED
HAZARD: May cause irritation; allergen; moderately toxic

Sodium Hydrosulfite
PCT: <20 CAS NO.: 7775-14-6 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Flammable solid; cause moderate eye irritation; allergen

Sodium Citrate
PCT: <10 CAS NO.: 68-04-2 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

1,10-Phenanthroline-p-toluenesulfonic Acid Salt
PCT: <5 CAS NO.: 92798-16-8 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Toxicity unknown; may cause irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: White powder ODOR: SO2
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not applicable BOILING POINT: NA MELTING PT.: ND
SPEC GRAVITY: ND pH: 5% sol'n = 5.29 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.003 in/yr STEEL: 0.106 in/yr
STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry, dark place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: In contact with water and air.
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: Heats spontaneously in contact with water; may react with oxidizers
HAZARDOUS DECOMP. PRODUCTS: Toxic fumes of SOx, Na2O in fire; corrosive fumes in contact with steam or acid
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Contact with steam, acids, combustibles, organics or oxidizers, sodium nitrite, aluminum powder, sodium chlorite; extreme heat or flames; excess moisture; exposure to light.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes and respiratory tract, and may cause allergic respiratory tract reaction.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Carcinogenicity testing was inconclusive for an ingredient of this mixture. An ingredient of this mixture is an experimental mutagen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: May cause eye and respiratory tract irritation; may cause allergic respiratory reaction. Ingestion of large amounts may cause diarrhea, stomach pains and vomiting. Can cause coughing, difficu breathing and chest pains.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye and resp conditions. Some asthmatics are said to be dangerously sensitive t minute amounts of sulfite in food.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, dispos latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minute physician. Wash skin with soap and plenty of water.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscio person.
INHALATION: Remove to fresh air. Give artificial respiration if neces Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop spilled material into a beaker and dissolve with water. Neutralize to a pH between 6 and 9 with an alka such as soda ash. Flush neutralized waste to the drain with an excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 19 1989. American Conference of Governmental Industrial Hygienists, 19
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janu 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
6) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th E New York: Van Nostrand Reinhold Co. 1984.
7) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products, 5t Ed. Baltimore: The Williams and Wilkins Co., 1984.
8) Outside testing.
9) Vendor information.
10) IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, Wor Health Organization (Volume 54) 1992, France.

SPECIAL NOTE: Sulfites are strong sensitizers. Inhalation and ingestion cause allergic respiratory reactions in asthmatics. Persons with respiratory conditions should take special care when working with produ that contain sulfites.

CAT. NO. 921

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 14041

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

POB: 145069
HACH ORDER#: 929671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Mercuric Nitrate 2.256 ± 0.005N
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00378

II. INGREDIENTS

Mercuric Nitrate, Monohydrate
PCT: 28 TO 38 CAS NO.: 7783-34-8 SARA: LISTED
TLV: 0.1 mg/M3 as Hg PEL: C: 0.1 mg/M3 Hg
HAZARD: Extremely toxic; corrosive; oxidizer; experimental teratogen

Nitric Acid
PCT: 18 TO 28 CAS NO.: 7697-37-2 SARA: LISTED
TLV: 2 ppm PEL: 2 ppm
HAZARD: Causes severe burns; powerful oxidizer

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear and colorless ODOR: Not determined
SOLUBILITY IN: WATER: Soluble ACID: Soluble in HNO3
OTHER: Not determined BOILING POINT: ND MELTING PT.: NA
SPEC GRAVITY: 1.27 pH: 0.6 VAPOR PRESSURE: Not determined
VAPOR DENSITY (air=1): ND EVAPORATION RATE: 0.86
METAL CORROSIVITY - ALUMINUM: ND STEEL: 0.004 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry place away from alkalies and oxidizable materials.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes in fire
OXIDIZER: strong NFPA Codes: Health: 3 Flammability: 0 Reactivity: 1
NFPA Symbol: oxy
CONDITIONS TO AVOID: Extreme temperature, contact with oxidizable materials, alcohols, sulfur, phosphine, hypophosphoric acid, alkalies.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, skin and respiratory tract.
ACUTE TOXICITY: Oral rat LD50 = 174 mg/Kg = Very toxic
ROUTES OF EXPOSURE: ingestion, skin absorption
TARGET ORGANS: kidneys, central nervous system, liver
CHRONIC TOXICITY: Danger of cumulative effects
ROUTES OF EXPOSURE: ingestion, skin absorption
TARGET ORGANS: kidneys, central nervous system, liver, brain
CANCER INFORMATION: An ingredient of this mixture is an experimental teratogen.
ROUTES OF EXPOSURE: ingestion, skin absorption
TARGET ORGANS: Not determined
OVEREXPOSURE: Causes severe burns. May cause ulcerations in the digestive tract if ingested. Mercury is a general protoplasmic poison; it circulates in the blood and is stored in the liver, kidneys, spleen and bones. May cause kidney damage.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Allergies or sensitivity to mercury; chronic respiratory disease, nervous system disorders or kidney disease

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Wash thoroughly after handling.
Keep away from oxidizable material.
PROTECTIVE EQUIPMENT: Adequate ventilation, lab grade goggles, neoprene gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 1 minutes. Remove contaminated clothing. Call physician.
INGESTION: Give large quantities of water. Call physician immediately
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: The toxicity of mercury is such that the element and its compounds should not be allowed to contaminate air o water. Soak up solution with inert material. Do not breathe fumes. Decontaminate the area with mercury absorbing compounds available commercially. Dispose of all mercury contaminated material in an EPA approved hazardous waste facility.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Corrosive Liquid, N.O.S. (Nitric Acid/Mer Nitrate Solution)
HAZARD CLASS: 8 ID: UN1760 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Corrosive Liquid, Toxic, N.O.S. (Nitric Acid/Mercuric Nitrate Solution)
HAZARD CLASS: 8 ID: UN2922 GROUP: II
SUBSIDIARY RISK: 6.1

I.M.O. PROPER SHIPPING NAME: Corrosive Liquid, Acidic, Inorganic, N.O.S (Nitric Acid/Mercuric Nitrate Solution)
HAZARD CLASS: 8 ID: UN3264 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 19 1989. American Conference of Governmental Industrial Hygienists, 19
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janu 19, 1989. pp. 2332-2983.
3) In-house information
4) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th E New York: Van Nostrand Reinhold Co. 1984.
5) Technical judgment
6) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
7) Outside testing.

SARA: This product contains a chemical or chemicals subject to the repor requirements of section 313 of Title III of the Superfund Amendments a Reauthorization Act of 1986 and 40 CFR Part 372.

PER CALIFORNIA PROPOSITION 65: "WARNING - This product contains a chemic known to the State of California to cause birth defects or other reproductive harm.

CAT. NO. 1816

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/31/95
CHANGE NO.: 16474

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sulfide 1 Reagent
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00213

II. INGREDIENTS

Sulfuric Acid
PCT: <65 CAS NO.: 7664-93-9 SARA: LISTED
TLV: 1 mg/M3 PEL: 1 mg/M3
IARC: LISTED
HAZARD: Causes severe burns. Harmful if inhaled. Known carcinogen

Other component
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, colorless or light brown ODOR: None
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: ~100°C MELTING PT.: NA SPEC GRAVITY: 1.500 pH: <0.5
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: hygro METAL CORROSIVITY - ALUMINUM: Corrosive
STEEL: 0.048 in/yr STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool place away from oxidizers and reducers.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: dry chemical. DO NOT USE WATER
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides in fire
OXIDIZER: mild NFPA Codes: Health: 3 Flammability: 0 Reactivity: 2
NFPA Symbol: W
CONDITIONS TO AVOID: Heat, flames, contact with oxidizers or reducers, caustics and caustic fumes, acetic acid, chlorosulfonic acid

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, skin and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Chronic irritation or inflammation, Teeth erosion
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: teeth, lungs
CANCER INFORMATION: An ingredient of this mixture is a known carcinogen.
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: nasal cavity, paranasal sinus, lungs, larynx
OVEREXPOSURE: Severely burns any tissue contacted. Breathing in the mist or vapor may cause mouth soreness, teeth erosion and difficulty in breathing. Inhalation of the mist or vapor of conc. sulfuric acid can cause cancer of the nasal tissue, lungs and larynx.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin and respiratory conditions

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessary. Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover the spill with excess soda ash or sodium bicarbonate. Scoop slurry to beaker. Adjust pH to between 6 and 9. Flush to the drain with excess water. Wash site with an alkali solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN1830 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN1830 GROUP: II

I.M.O. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN1830 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, World Health Organization (Volume 54) 1992, France.

SPECIAL NOTE: The IARC evaluation was based on exposure to the mist or vapor of concentrated sulfuric acid generated during chemical processes.

SARA: This product contains a chemical or chemicals subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

CAT. NO. 1817

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

POB: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sulfide 2 Reagent
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00435

II. INGREDIENTS

Potassium Dichromate
PCT: <1 CAS NO.: 7778-50-9 SARA: LISTED
TLV: 0.05 mg/M3 as Cr PEL: 0.1 mg/M3 Cr(VI)
IARC: LISTED NTP: LISTED
HAZARD: Recognized carcinogen; causes severe burns; very toxic

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, orange ODOR: None
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: ~100°C MELTING PT.: NA SPEC GRAVITY: 0.987 pH: 4.2
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: ND METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: None
HAZARDOUS DECOMP. PRODUCTS: None
OXIDIZER: No NFPA Codes: Health: 0 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Extreme temperatures, evaporation

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes and skin, and may cause allergic skin reaction.
ACUTE TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is a known carcinogen.
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: lungs, paranasal sinus, nasal tissue
OVEREXPOSURE: May cause irritation, allergic skin reaction, liver and kidney damage.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Allergies or sensitivity to chromic acid or chromates

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. C physician. Remove contaminated clothing. Wash skin with soap and plenty water.
INGESTION: Give large quantities of water or milk. Induce vomiting by sticking finger down throat. Never give anything by mouth to an unconscious person. Call physician.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Absorb material on non-reactive material. Sc up the material and dispose of in an EPA approved hazardous waste facility. Decontaminate site with a soap solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) In-house information
2) Technical judgment
3) IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans, World Health Organization (Volumes 1-42) Supplement 7, 1987, France.
4) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.
5) NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards. Cincinnati: Department of Health and Human Services, 1981.

SARA: This product contains a chemical or chemicals subject to the reporti requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

PER CALIFORNIA PROPOSITION 65: "WARNING - This product contains a chemical known to the State of California to cause cancer."

CAT. NO. 1877

MATERIAL SAFETY DATA SHEET

MSDS DATE: 9/12/95
CHANGE NO.: 0795

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Kerosene Thermometer
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable

II. INGREDIENTS

Kerosene
PCT: >98 CAS NO.: 8008-20-6 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Aspiration is dangerous; moderately toxic; causes irritation

Aniline
PCT: <1% CAS NO.: 62-53-3 SARA: LISTED
TLV: 2 ppm (skin) PEL: 2 ppm (skin)
HAZARD: Poisonous by all routes of exposure; strong irritant

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Red ODOR: fuel like
SOLUBILITY IN: WATER: Insoluble ACID: Insoluble
OTHER: organic solvents BOILING POINT: ND MELTING PT.: NA
SPEC GRAVITY: ~0.8 pH: Not applicable VAPOR PRESSURE: ND
VAPOR DENSITY (air=1): ND EVAPORATION RATE: ND
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Not applicable

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: 79°C 175°F METHOD: ND
FLAMMABILITY LIMITS - LOWER: ~0.7% UPPER: ~5%
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: Combustible liquid; emits acrid smoke and irritating fumes in fire.
HAZARDOUS DECOMP. PRODUCTS: Not determined
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 2 Reactivity: 0
CONDITIONS TO AVOID: Heat and flames; contact with oxidizers.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: ingestion, inhalation, skin absorption
TARGET ORGANS: lungs, kidneys, central nervous system
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: Aspiration causes inflammation of the lungs. Causes irritation. Inhalation and ingestion cause central nervous system depression, drunkeness, headache, nausea.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin and respiratory tract irritation.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. C physician. Wash skin with soap and plenty of water.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Remove all sources of ignition. Absorb spill with non-reactive absorbent. Do not breathe fumes. Incinerate materia in an EPA-approved facility.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989
4) Vendor Information.
5) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
6) Technical judgment
7) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.
8) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984.
9) IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans, World Health Organization (Volumes 1-42) Supplement 7, 1987, France.

SPECIAL NOTE: Exposure to aniline and kerosene will occur only in the event the thermometer is broken. A kerosene thermometer contains a red fluid; mercury metal thermometer contains a silver fluid. If you do not have th correct MSDS for this product please contact Hach Company.

SARA: This product contains a chemical or chemicals subject to the reportin requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

PER CALIFORNIA PROPOSITION 65: "WARNING - This product contains a chemical known to the State of California to cause cancer."

Hach Company, WORLD HEADQUARTERS, PO Box 389, Loveland, CO 80539

Hach Europe, BP 229, B5000 Namur 1, BELGIUM

CAT. NO. 1995

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 14646

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Molybdate 3 Reagent for Silica
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00187

II. INGREDIENTS

Sodium Bisulfate Monohydrate
PCT: <20 CAS NO.: 10034-88-5 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes eye burns; moderately toxic; causes skin irritation

Sulfuric Acid
PCT: <15 CAS NO.: 7664-93-9 SARA: LISTED
TLV: 1 mg/M3 PEL: 1 mg/M3
IARC: LISTED
HAZARD: Causes severe burns. Harmful if inhaled. Known carcinogen

Molybdic Acid
PCT: <15 CAS NO.: 7782-91-4 SARA: NOT LISTED
TLV: 10 mg/m³ as Mo PEL: 10 mg/m³ as Mo
HAZARD: Very Toxic; Causes irritation.

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, colorless ODOR: Not determined
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: ~100°C MELTING PT.: NA SPEC GRAVITY: 1.2-1.3 pH: <0.5
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: ND METAL CORROSIVITY - ALUMINUM: Corrosive
STEEL: Corrosive STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool place away from oxidizers and reducers.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: >212°F; >100°C METHOD: closed cup
FLAMMABILITY LIMITS - LOWER: ND UPPER: ND
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes of sulfur oxides
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Heat, flames, contact with oxidizers or reducers

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, skin and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: lungs
CHRONIC TOXICITY: Teeth erosion, Chronic inflammation or irritation
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: lungs, teeth
CANCER INFORMATION: An ingredient of this mixture is a known carcinogen.
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: nasal cavity, paranasal sinus, lungs, larynx
OVEREXPOSURE: Burns any tissue contacted. Breathing sulfuric acid mist or vapor may cause erosion of teeth, mouth soreness, difficulty in breathing. Molybdenum compounds may cause loss of coordination, loss of appetite, anemia; may induce copper deficiency.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Chronic eye, skin and respiratory disease, blood conditions, gout may be aggravated by exposure to molybdenum compounds.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessary. Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover the spill with excess soda ash or sodium bicarbonate. Scoop slurry to beaker. Adjust pH to between 6 and 9. Flush to the drain with excess water. Wash site with an alkali solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN1830 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN2796 GROUP: II

I.M.O. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN2796 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical Judgment
5) IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, World Health Organization (Volume 54) 1992, France.

SPECIAL NOTE: The IARC evaluation was based on exposure to the mist or vapor of concentrated sulfuric acid generated during chemical processes.

SARA: This product contains a chemical or chemicals subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

CAT. NO. 2125

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 12060

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145669
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: PhosVer ® 3 Phosphate Reagent
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00035

II. INGREDIENTS

Potassium Pyrosulfate
PCT: <85 CAS NO.: 7790-62-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes eye burns

L-Ascorbic Acid
PCT: <25 CAS NO.: 50-81-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Practically non-toxic

Sodium Molybdate
PCT: <5 CAS NO.: 7631-95-0 SARA: NOT LISTED
TLV: 5 mg/M3 as Mo PEL: 5 mg/M3 as Mo
HAZARD: Moderately toxic; may cause irritation

Other components, each
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: White powder ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: NA MELTING PT.: 105°C SPEC GRAVITY: 2.22
pH: of 5% soln = 1.5 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.122 in/yr STEEL: 0.295 in/yr
STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry, dark place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 1 Reactivity: 0
CONDITIONS TO AVOID: Heat, flames, exposure to light or moisture, contamination with phosphates. Contact with oxidizers, dyes, alkalies, copper or iron.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, irritating to respiratory tract
ACUTE TOXICITY: Moderately Toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: liver
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: carcinogenicity testing in progress for a component of this product
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: May cause eye burns and respiratory tract irritation. May affect enzyme activity, induce copper deficiency, may cause anemia, gout or liver damage. May cause loss of coordination and appetite, listlessness, or diarrhea.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye and respiratory tract conditions, blood disease; gout may be aggravated by exposure to molybdenum compounds.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessary. Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop spilled material into a beaker and dissolve with water. Neutralize to a pH between 6 and 9 with an alkali such as soda ash. Flush neutralized waste to the drain with an excess of water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Corrosive Solid, N.O.S. (Potassium Pyrosulphate Mixture)
HAZARD CLASS: 8 ID: UN1759 GROUP: III

I.C.A.O. PROPER SHIPPING NAME: Corrosive Solid, acidic, inorganic, N.O.S. (Potassium Pyrosulphate Mixture)
HAZARD CLASS: 8 ID: UN3260 GROUP: III

I.M.O. PROPER SHIPPING NAME: Corrosive Solid, acidic, inorganic, N.O.S. (Potassium Pyrosulphate Mixture)
HAZARD CLASS: 8 ID: UN3260 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Outside testing.
5) Technical Judgment
6) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984.
7) Patty, Frank A. Industrial Hygiene and Toxicology, 3rd Revised Editio Volume 2. New York: A Wiley-Interscience Publication, 1981.
8) NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards. Cincinnati: Department of Health and Human Services, 1981.

CAT. NO. 2127

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/31/95
CHANGE NO.: A265

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Neutralizing Reagent Powder Pillows
CAS NO.: 1310-66-3 CHEMICAL NAME: Lithium Hydroxide
FORMULA: LiOH H2O CHEMICAL FAMILY: Caustic Alkali
MSDS NUMBER: M00837

II. INGREDIENTS

Lithium Hydroxide, Monohydrate
PCT: 100 CAS NO.: 1310-66-3 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Very toxic; corrosive

III. PHYSICAL DATA

STATE: solid APPEARANCE: White powder ODOR: Suffocating
SOLUBILITY IN: WATER: Soluble ACID: Not determined OTHER: Alcohol
BOILING POINT: NA MELTING PT.: 471 C SPEC GRAVITY: 1.51
pH: of 0.1 N soln. = 14 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.228 in/yr STEEL: 0.00 in/yr
STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: May emit toxic or corrosive fumes in fire; contact with metals may produce hydrogen gas
HAZARDOUS DECOMP. PRODUCTS: May emit toxic, corrosive fumes in fire or in contact with acids or water
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 1 Reactivity: 1
CONDITIONS TO AVOID: Contact with acids, water, combustible materials, metals; extreme temperatures, excess moisture

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, skin and respiratory tract.
ACUTE TOXICITY: Oral rat LD50 = 225 mg/Kg = Very Toxic
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: kidneys, central nervous system, bone marrow
CHRONIC TOXICITY: See "Overexposure" section
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Causes severe burns. Signs of lithium poisoning include: anorexia, weight loss, weakness, dehydration, thirst, dry mouth, skin rashes, salivation, nausea, vomiting, diarrhea, hand & facial tremors, CNS effects, kidney damage, coma, and death.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Respiratory diseases, especially those obstructing the airway; skin disorders; eye conditions; pre-existing kidney disorders.

VI. PRECAUTIONARY MEASURES

Keep away from acids.
Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
Use only with adequate ventilation.
PROTECTIVE EQUIPMENT: lab grade goggles, lab coat, rubber gloves, fume hood

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessary. Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop material into a beaker and dissolve with water. Neutralize to a pH between 6 and 9 with an acid such as hydrochloric acid. Flush neutralized waste to the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Lithium Hydroxide, Solid
HAZARD CLASS: 8 ID: UN2680 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Lithium Hydroxide Monohydrate
HAZARD CLASS: 8 ID: UN2680 GROUP: II

I.M.O. PROPER SHIPPING NAME: Lithium Hydroxide Monohydrate
HAZARD CLASS: 8 ID: UN2680 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989
4) Technical Judgment
5) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.
6) NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards. Cincinnati: Department of Health and Human Services, 1981.
7) Vendor information.
8) Outside testing.

SPECIAL NOTE: Lithium compounds have been implicated in development of aplastic anemia.

CAT. NO. 2207

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 7557

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Hexteb Dry Fuel Tablets
CAS NO.: 100-97-0
CHEMICAL NAME: 1,3,5,7-Tetraazotricyclo(3.3.1.1) decane
FORMULA: $(CH_2)_6N_4$ CHEMICAL FAMILY: Aromatic Amines

II. INGREDIENTS

Hexamethylenetetramine
PCT: 100 CAS NO.: 100-97-0 SARA: NOT LISTED
TLV: Not determined PEL: Not determined
HAZARD: Moderately toxic; may cause irritation; flammable

III. PHYSICAL DATA

STATE: solid APPEARANCE: White granular powder ODOR: Faint amine
SOLUBILITY IN: WATER: Soluble ACID: Decomposes
OTHER: Alcohol, ether, chloroform BOILING POINT: Subl.
MELTING PT.: 263C decomp. SPEC GRAVITY: 1.270 pH: 8.2 M soln. = 8.4
VAPOR PRESSURE: Not applicable VAPOR DENSITY (air=1): NA
EVAPORATION RATE: NA METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool area, away from acids and oxidizers.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: 250C; 482F METHOD: open cup
FLAMMABILITY LIMITS - LOWER: ND UPPER: ND
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: When exposed to heat, flame or oxidizers; may emit toxic fumes
HAZARDOUS DECOMP. PRODUCTS: React with acid to form formaldehyde; formaldehyde, ammonia, NOx and CO in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 1 Reactivity: 1
CONDITIONS TO AVOID: Contact with oxidizers, Na_2O, acids, heat and open flames

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes, skin, respiratory tract, and may cause allergic skin reaction.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: ingestion
TARGET ORGANS: gastrointestinal tract, kidneys, lungs
CHRONIC TOXICITY: Repeated contact may cause skin sensitization
ROUTES OF EXPOSURE: contact
TARGET ORGANS: skin
CANCER INFORMATION: Experimental neoplasm formation (benign or malignant tumors)
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: If swallowed, may cause gastrointestinal irritation, kidney damage. If inhaled, may act as a nuisance dust, causing reversible lung damage.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Allergies or sensitivity to hexamethylenetetramine or formaldehyde

VI. PRECAUTIONARY MEASURES

Wash thoroughly after handling.
Avoid contact with eyes, skin and clothing.
Do not breathe chemicals.
Keep away from oxidizers.
Keep away from acids.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air. Give artificial respiration if necessa Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Dissolve or mix the material with a combust solvent. Burn in an EPA approved hazardous waste incinerator.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Hexamine
HAZARD CLASS: 4.1 ID: UN1328 GROUP: III

I.C.A.O. PROPER SHIPPING NAME: Hexamethylenetetramine
HAZARD CLASS: 4.1 ID: UN1328 GROUP: III

I.M.O. PROPER SHIPPING NAME: Hexamethylenetetramine
HAZARD CLASS: 4.1 ID: UN1328 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988 1989. American Conference of Governmental Industrial Hygienists, 1988
2) 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor)
3) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989
4)
5) Vendor information.
6) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed New York: Van Nostrand Reinhold Co. 1984.
7) Technical judgment
8) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
9) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984.
10) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U. S. Department of Health and Human Services, April, 19

CAT. NO. 942

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/31/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

POB: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Phenolphthalein Indicator
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00008

II. INGREDIENTS

Sodium Chloride
PCT: >95 CAS NO.: 7647-14-5 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye irritation.

Phenolphthalein
PCT: <2 CAS NO.: 77-09-8 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Other component
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: Pink crystalline powder ODOR: Not determined
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: 258 - 262°C
SPEC GRAVITY: 2.18 pH: of 5% soln. = 6.2 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND EXTINGUISHING MEDIA: water
FIRE/EXPLOSION HAZARDS: May emit acrid smoke and fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of chloride and sodium oxide in fire.
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, moisture; contact with bromine trifluoride, lithium

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes and skin.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: Causes moderate eye and mild skin irritation. Produces dehydration and irritates the stomach if ingested in large quantities, causing vomiting, diarrhea, muscular twitching and rigidity, collapse, death. May cause blood pressure problems.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye conditions.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: acequate ventilation, lab grade goggles

VII. FIRST AID

EYE AND SKIN CONTACT: Flush with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Sweep up powder. Avoid breathing material. Dissolve in water. Flush down the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 19
1989. American Conference of Governmental Industrial Hygienists, 19
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janu
19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Acta Anat. 74: 121-124 (1969)
6) Journal of Clinical Investigations 41: 710-714 (1962)

SPECIAL NOTE: In a laboratory test, single subcutaneous injection of sod chloride into pregnant mice at the level of 2500 mg/Kg caused fetal de and malformations. In a laboratory test, mice given a 2% sodium chlor solution in place of drinking water during pregnancy produced hyperten adult offspring.

CAT. NO. [illegible]

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 0745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Bromocresol Green-Methyl Red
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00889

II. INGREDIENTS

Potassium Chloride
PCT: >98 CAS NO.: 7447-40-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye irritation

Other components, each
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: Red-brown or green ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: 181°C
SPEC GRAVITY: 1.91 pH: of 5% soln. = 9.8 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic chloride fumes in fire
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Extreme heat; contact with acids.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: circulatory system
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: May cause eye, skin and respiratory tract irritation. May cause stomach disturbances, weakness, circulatory and heart problems.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Persons with impaired kidney function may be more susceptible to the effects of potassium chloride

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
Keep away from acids.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Sweep up powder. Avoid breathing material Dissolve in water. Flush down the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 19 1989. American Conference of Governmental Industrial Hygienists, 19
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janu 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

CAT. NO. 14033

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12968

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Cyclohexanone
CAS NO.: 108-94-1 CHEMICAL NAME: Cyclohexanone
FORMULA: C6H10O CHEMICAL FAMILY: Ketones
MSDS NUMBER: M00108

II. INGREDIENTS

Cyclohexanone
PCT: 100 CAS NO.: 108-94-1 SARA: NOT LISTED
TLV: 25 ppm - skin PEL: 25 ppm - skin
IARC: LISTED
HAZARD: Combustible; Causes eye irritation; Moderately toxic

III. PHYSICAL DATA

STATE: liquid APPEARANCE: White to yellow, oily ODOR: Peppermint
SOLUBILITY IN: WATER: Slightly soluble ACID: Not determined
OTHER: Most organic solvents BOILING POINT: 155.6°C MELTING PT.: -47°C
SPEC GRAVITY: 0.948 pH: Not determined VAPOR PRESSURE: 136 mm @ 100°C
VAPOR DENSITY (air=1): 3.4 EVAPORATION RATE: ND
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry, dark place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: 44°C; 111°F METHOD: closed cup
FLAMMABILITY LIMITS - LOWER: 1.1% UPPER: 9.4%
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: 420°C; 788°F
EXTINGUISHING MEDIA: dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: Combustible; may react violently with oxidizers
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of carbon monoxide and carbon dioxide.
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 2 Reactivity: 0
CONDITIONS TO AVOID: Extreme temperatures; contact with oxidizers such as nitric acid, hydrogen peroxide, reducers, acids and alkalies.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Oral rat LD50 = 1535 mg/kg = Moderately toxic; Inhalation rat LC50 = 8000 ppm/4 hours; Skin rabbit LD50 = 948 mg/kg
ROUTES OF EXPOSURE: Ingestion, inhalation, skin absorption
TARGET ORGANS: kidneys, liver
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: kidneys, liver
CANCER INFORMATION: experimental mutagen
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: Causes severe eye and mild skin irritation. May cause nausea, vomiting, diarrhea, headaches, weakness, dizziness, drowsiness, loss of coordination, central nervous system depression, loss of consciousness, coma, death.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing liver and kidney conditions.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe vapor.
Wash thoroughly after handling.
Keep away from heat, sparks and open flame.
Keep away from oxidizers.
PROTECTIVE EQUIPMENT: fume hood, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessary Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Remove all sources of ignition. Absorb spill with non-reactive absorbent. Do not breathe fumes. Incinerate material in an EPA-approved facility.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Cyclohexanone
HAZARD CLASS: 3 ID: UN1915 GROUP: III

I.C.A.O. PROPER SHIPPING NAME: Cyclohexanone
HAZARD CLASS: 3 ID: UN1915 GROUP: III

I.M.O. PROPER SHIPPING NAME: Cyclohexanone
HAZARD CLASS: 3.3 ID: UN1915 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.
4) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989
5) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
6) Technical judgment
7) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U. S. Department of Health and Human Services, April, 198
8) Patty, Frank A. Industrial Hygiene and Toxicology, 3rd Revised Editio Volume 2. New York; A Wiley-Interscience Publication, 1981.

CAT. NO. 14034

MATERIAL SAFETY DATA SHEET

PO#: 145269
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: NitraVer ® 5 Nitrate Reagent
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00049

II. INGREDIENTS

Sulfanilic Acid
PCT: <35 CAS NO.: 121-57-3 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Potassium Phosphate, Monobasic
PCT: <35 CAS NO.: 7778-77-0 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Cadmium
PCT: <20 CAS NO.: 7440-43-9 SARA: LISTED
TLV: 0.05 mg/M3 PEL: 0.005 mg/M3
IARC: LISTED NTP: LISTED
HAZARD: Very toxic; recognized carcinogen; may cause irritation

Gentisic Acid
PCT: <20 CAS NO.: 490-79-9 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic

Magnesium Sulfate Heptahydrate
PCT: <15 CAS NO.: 7487-88-9 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Other components, each
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: Gray powder ODOR: None
SOLUBILITY IN: WATER: Moderately soluble ACID: Moderately soluble
OTHER: Not determined BOILING POINT: NA MELTING PT.: ~180°C
SPEC GRAVITY: ~2.00 pH: of 5% soln. = 2.8
VAPOR PRESSURE: Not applicable VAPOR DENSITY (air=1): NA
EVAPORATION RATE: NA METAL CORROSIVITY - ALUMINUM: 0.000 in/yr
STEEL: 0.001 in/yr STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: Not applicable AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire.
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of cadmium oxide, nitrogen oxides and sulfur oxides in fire.
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 2 Reactivity: 0
CONDITIONS TO AVOID: Unnecessary exposure to moisture. Avoid creation of dust. Contact with hydrazoic acid, ammonium nitrate, sulfur, selenium, tellurium, molten aluminum, or oxidizers.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Oral rat LD50 = 1500 mg/Kg = Moderately toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: kidneys, respiratory tract, lungs, central nervous system, reproductive system
CHRONIC TOXICITY: Danger of cumulative effects
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: lungs, kidneys
CANCER INFORMATION: An ingredient of this mixture is a recognized carcinogen.
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: lungs, reproductive system, kidneys
OVEREXPOSURE: May cause irritation, chest pain, sweating, chills, weakness decreased locomotor activity, respiratory depression, diarrhea, vomiting ulcerations of stomach, gas, liver and kidney damage, emphysema, and death.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin, and respiratory tract conditions, liver, kidney, stomach or heart disease

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: fume hood/respirator, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Ca physician. Wash skin with soap and plenty of water.
INGESTION: Administer milk or beaten egg whites at frequent intervals. Induce vomiting. Never give anything by mouth to an unconscious person. Call physician.
INHALATION: Remove to fresh air. Give artificial respiration if necessary Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop up material. Decontaminate site. Dispos of the material in an E.P.A. approved hazardous waste site.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Vendor information.
6) Outside testing.
7) NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards. Cincinnati: Department of Health and Human Services, 1981.
8) IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans, World Health Organization (Volumes 1-42) Supplement 7, 1987, France.
9) 29 CFR 1900 - 1918 (Code of Federal Regulations - Labor)

SPECIAL NOTE: In laboratory tests, when magnesium sulfate was given to pregnant rats, a sharp reduction of both the number and the weight of th offspring was observed.

SARA: This product contains a chemical or chemicals subject to the reporti requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

PER CALIFORNIA PROPOSITION 65: "WARNING - This product contains a chemical known to the State of California to cause cancer."

CAT. NO. 14064

MATERIAL SAFETY DATA SHEET

POR: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: DPD Total Chlorine Reagent
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00118

II. INGREDIENTS

Carboxylate Salt (Trade Secret)
PCT: 30 TO 60 CAS NO.: Confidential SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Toxicity unknown

Sodium Phosphate, Dibasic, Anhydrous
PCT: 15 TO 40 CAS NO.: 7558-79-4 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Potassium Iodide
PCT: 15 TO 40 CAS NO.: 7681-11-0 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Salt of N,N-Diethyl-p-Phenylenediamine
PCT: 1 TO 5 CAS NO.: Confidential SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause skin sensitization

Other component
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: White to pale pink powder ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: NA MELTING PT.: ND SPEC GRAVITY: ND
pH: 6.39 (1%soln @25°C) VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.006 in/yr STEEL: 0.038 in/yr
STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry, dark place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire.
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of phosphorus oxides, iodine, iodine compounds in fire.
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 1 Reactivity: 0
CONDITIONS TO AVOID: Extreme temperatures, excess moisture, exposure to light

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes, skin, respiratory tract, and may cause allergic skin reaction.
ACUTE TOXICITY: Oral rat LD50 = 5850 mg/kg = Slightly toxic
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: Not determined
CANCER INFORMATION: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: May cause eye, skin and respiratory tract irritation, skin sensitization. May cause chronic "iodism": skin rash, conjunctivitis, runny nose, sneezing, bronchitis, headache, fever, irritation of mucous membranes.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Allergy or sensitivity to salts of N,N-Diethyl-p-Phenylenediamine; pre-existing eye, skin and respirator tract conditions.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes.
Avoid prolonged or repeated contact with skin.
Do not breathe dust.
Wash thoroughly after handling.
Keep protected from sunlight.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Ca physician. Remove contaminated clothing. Wash skin with soap and plenty water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Sweep up powder. Avoid breathing material. Dissolve in water. Flush down the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Vendor information.
6) Outside testing.

SPECIAL NOTE: Oral rat LD50 = 5850 mg/kg SPECIAL NOTE: HMIRC Registry #2786 - 6/11/91

CAT. NO. 14065

MATERIAL SAFETY DATA SHEET

POB: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 15025

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: NitriVer ® 3 Nitrite Reagent
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00055

II. INGREDIENTS

Potassium Phosphate, Monobasic
PCT: <85 CAS NO.: 7778-77-0 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Sodium Sulfanilate
PCT: <15 CAS NO.: 515-74-2 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Toxicity unknown; may cause irritation

Potassium Pyrosulfate
PCT: <10 CAS NO.: 7790-62-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Aqueous solution is strongly acidic

4,5-Dihydroxy-2,7-naphthalenedisulfonic Acid, Disodium Salt
PCT: <5 CAS NO.: 129-96-4 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

1,2-Cyclohexanediaminetetraacetic Acid, Trisodium Salt (CDTA)Na3
PCT: <5 CAS NO.: 36679-96-6 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Toxicity unknown; may cause irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: White powder ODOR: Not determined
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: ~224°C
SPEC GRAVITY: ND pH: of 5% soln. = 3.2 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.00 in/yr STEEL: 0.057 in/yr
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of phosphorus oxides in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Heat, moisture

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, irritating to skin and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Causes burns to eyes. May cause irritation to skin and respiratory tract. May cause stomach disturbances, heart problems, central nervous system depression and kidney damage.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin, heart and kidney conditions

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Call physician. Flush skin with plenty of water.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessary. Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop spilled material into a beaker and dissolve with water. Neutralize to a pH between 6 and 9 with an alkali such as soda ash. Flush neutralized waste to the drain with an excess of water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

CAT. NO. 14070

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: DPD Free Chlorine Reagent
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00109

II. INGREDIENTS

Carboxylate Salt (Trade Secret)
PCT: 40 TO 70 CAS NO.: Confidential SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Toxicity unknown

Sodium Phosphate, Dibasic, Anhydrous
PCT: 30 TO 60 CAS NO.: 7558-79-4 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Salt of N,N-Diethyl-p-Phenylenediamine
PCT: 1 TO 5 CAS NO.: Confidential SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause skin sensitization

Ethylenediaminetetraacetic Acid, Disodium Salt, Dihydrate
PCT: 1 TO 5 CAS NO.: 6381-92-6 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; May cause irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: White to pale pink powder ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: NA MELTING PT.: ND SPEC GRAVITY: 1.76
pH: 6.48 (1%soln @25°C) VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry, dark place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of phosphorus oxides in fire
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 1 Reactivity: 0
CONDITIONS TO AVOID: Extreme temperatures, excess moisture, exposure to light

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes and respiratory tract, and may cause allergic skin reaction.
ACUTE TOXICITY: Moderately Toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: Not determined
CANCER INFORMATION: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: Contact may cause eye and respiratory tract irritation, skin sensitization
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Allergy or sensitivity to salts of N,N-Diethyl-p-Phenylenediamine; pre-existing eye and respiratory conditions

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes.
Avoid prolonged or repeated contact with skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Ca physician. Remove contaminated clothing. Wash skin with soap and plenty water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Sweep up powder. Avoid breathing material. Dissolve in water. Flush down the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2985.
3) In-house information
4) Technical judgment

SPECIAL NOTE: HMIRC Registry #2785 - 6/11/91

CAT. NO. 14188

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12668

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: CuVer ® 1 Copper Reagent
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00066

II. INGREDIENTS

Sodium Phosphate, Dibasic, Anhydrous
PCT: <50 CAS NO.: 7558-79-4 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye and respiratory tract irritation

Potassium Phosphate, Monobasic
PCT: <50 CAS NO.: 7778-77-0 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Sodium Ascorbate
PCT: <20 CAS NO.: 134-03-2 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

2,2'-Bicinchoninate, Dipotassium
PCT: <5 CAS NO.: 63451-34-3 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye and respiratory tract irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: White powder ODOR: Like brown sugar
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: 182C decomp.
SPEC GRAVITY: 2.52 pH: of 5% soln. = 6.5 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: None STEEL: None STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of phosphorus oxides in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, moisture

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: May cause eye and respiratory tract irritation, stomach disturbances, heart problems, central nervous system depression.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye and respiratory tract conditions.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. C physician. Wash skin with soap and plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Sweep up powder. Avoid breathing material. Dissolve in water. Flush down the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Vendor information.

CAT. NO. 14202

MATERIAL SAFETY DATA SHEET

POS: 145069
HACH ORDER NO: 979671

MSDS DATE: 11/02/93
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Buffer Powder Pillows Citrate Type for Heavy Metals
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable

II. INGREDIENTS

Citric Acid, Anhydrous
PCT: <80 CAS NO.: 77-92-9 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes severe eye irritation. May cause skin irritation.

Hydrazine Sulfate
PCT: <20 CAS NO.: 10034-93-2 SARA: LISTED
TLV: 0.1 ppm as H2NNH PEL: 0.1 ppm as H2NNH
IARC: LISTED NTP: LISTED
HAZARD: Causes irritation; suspected carcinogen; moderately toxic

Sodium Citrate
PCT: <20 CAS NO.: 68-04-2 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: White powder ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: NA MELTING PT.: 153°C SPEC GRAVITY: 1.74
pH: of 1% soln. = 2.4 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.005 in/yr STEEL: 0.23 in/yr
STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May react vigorously with oxidizers; may emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides, nitrogen oxides, ammonia.
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 2 Reactivity: 0
CONDITIONS TO AVOID: Heat, flames, contact with oxidizers, metal nitrates, nitrites

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin, respiratory tract, and may cause allergic skin reaction.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: ingestion, inhalation, skin absorption
TARGET ORGANS: central nervous system
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: ingestion, inhalation, skin absorption
TARGET ORGANS: liver, bone marrow
CANCER INFORMATION: An ingredient of this mixture is a suspected carcinogen.
ROUTES OF EXPOSURE: ingestion, inhalation, intraperitoneal
TARGET ORGANS: liver, lungs, mammary glands, nasal tissue, connective tissue
OVEREXPOSURE: Causes eye, skin and respiratory irritation. May cause an allergic skin reaction, problems with stomach, intestines and central nervous system. Chronic overexposure may cause liver damage and irreversible injury to blood forming tissue.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin, respiratory and liver disorders

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
Keep away from heat, sparks and open flame.
Keep away from oxidizers.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Induce vomiting by sticking finger down throat. Never give anything by mouth to an unconscious person. Call physician.
INHALATION: Remove to fresh air. Give artificial respiration if necessar Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Dissolve or mix the material with a combusti solvent. Burn in an EPA approved hazardous waste incinerator.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Fourth Annual Report on Carcinogens, 1983. National Toxicology Progra Public Information Office NTP 85-002.
6) IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans, World Health Organization (Volumes 1-42) Supplement 7, 1987, France.
7) List of Dangerous Substances Classified in Annex I of the EEC Directiv (67/548) - Classification, Packaging and Labelling of Dangerous Substances, Ammended November, 1986.

SPECIAL NOTE: Peripheral nerve damage has been noted in humans for hydrazi sulfate at a dosage of 20l/mg/kg/8 day.

SARA: This product contains a chemical or chemicals subject to the reporti requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

PER CALIFORNIA PROPOSITION 65: "WARNING - This product contains a chemical known to the State of California to cause cancer."

CAT. NO. 14254

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Iron 50 mg/L as Fe
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00418

II. INGREDIENTS

Hydrochloric Acid
PCT: <1 CAS NO.: 7647-01-0 SARA: LISTED
TLV: 5 ppm ceiling PEL: 5 ppm ceiling
HAZARD: Causes burns

Ferric Chloride
PCT: <0.1 CAS NO.: 10025-77-1 SARA: NOT LISTED
TLV: 1 mg/M3 as Fe PEL: 1 mg/M3 as Fe
HAZARD: Causes eye burns, Moderately toxic

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, colorless ODOR: None
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: 100C MELTING PT.: NA SPEC GRAVITY: 0.99 pH: 1.1
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.88 METAL CORROSIVITY - ALUMINUM: 0.143 in/yr
STEEL: 0.134 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: Not applicable
HAZARDOUS DECOMP. PRODUCTS: Not applicable
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, evaporation; contact with hydroxides

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes.
ACUTE TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CHRONIC TOXICITY: Not Determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: May cause eye irritation.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes.
Do not breathe mist.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Ca physician. Wash skin with soap and plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover the spill with excess soda ash or sodiu bicarbonate. Scoop slurry to beaker. Adjust pH to between 6 and 9. Flush to the drain with excess water. Wash site with an alkali solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

CAT. NO. 14299

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 13698

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Demineralizer Bottle
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Ion Exchange Resins
MSDS NUMBER: M88263

II. INGREDIENTS

Sulfonated Copolymer of Styrene/Divinylbenzene
PCT: 20-30 CAS NO.: 69011-20-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye irritation

Trimethylaminated, Chloromethylated Copolymer of Styrene/Divinylbenzene
PCT: 15-30 CAS NO.: 69011-18-3 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye irritation

Demineralized Water
PCT: 50-60 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: solid APPEARANCE: Gold and purple beads ODOR: Slight, fishy
SOLUBILITY IN: WATER: Negligible ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: 204°C decomp
SPEC GRAVITY: 1.2 pH: Aq. slurry: 6 - 9
VAPOR PRESSURE: H2O: 17 mm @ 20°C VAPOR DENSITY (air=1): 0.62
EVAPORATION RATE: 1 METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: Stable
STORAGE PRECAUTIONS: Protect from freezing. Do not allow product to dry out.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: >500°C
EXTINGUISHING MEDIA: dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: May react explosively with oxidizers. May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of styrene, divinylbenzene, carbon oxides in fire
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 1 Reactivity: 0
CONDITIONS TO AVOID: Avoid freezing or storage above 50°C because product contains water which will freeze/dry out and damage product. Contact with strong oxidizers may cause explosive reaction.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes.
ACUTE TOXICITY: No significant health hazard
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: May cause eye irritation
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
Keep away from oxidizers.
PROTECTIVE EQUIPMENT: lab grade goggles

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. C physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Place material in a plastic bag, add non-reactive absorbant material if waste contains free liquid, seal and dispose of as normal trash. Label bag: "Non-hazardous Waste".
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) Vendor information.
4) Technical judgment

CAT. NO. 14379

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sodium Hydroxide 1.400 ± 0.008 N
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00382

II. INGREDIENTS

Sodium Hydroxide
PCT: <10 CAS NO.: 1310-73-2 SARA: NOT LISTED
TLV: 2 mg/M3 PEL: 2 mg/M3
HAZARD: Corrosive, very toxic

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, colorless ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: ~100C MELTING PT.: NA SPEC GRAVITY: 1.064 pH: 14
VAPOR PRESSURE: ND VAPOR DENSITY (air=1): ND EVAPORATION RATE: 0.58
METAL CORROSIVITY - ALUMINUM: >20 in/yr. STEEL: 0.00 in/yr.
STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place away from acids.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: Contact with strong acids may liberate enough heat to ignite combustibles
HAZARDOUS DECOMP. PRODUCTS: None
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, evaporation; contact with strong acids, flammable liquids, organic halogen compounds, aluminum, tin, zinc, nitromethane, other nitro compounds

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, skin and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Causes severe burns to all body tissues contacted
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Chronic eye, skin and respiratory conditions

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover spill with citric acid or another solid acidic material. Scoop slurry to beaker. Add water and neutralize liquid to a pH between 6 and 9. Flush neutralized waste to the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Sodium Hydroxide Solution
HAZARD CLASS: 8 ID: UN1824 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Sodium Hydroxide Solution
HAZARD CLASS: 8 ID: UN1824 GROUP: II

I.M.O. PROPER SHIPPING NAME: Sodium Hydroxide, Solution
HAZARD CLASS: 8 ID: UN1824 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) Technical judgment
4) In-house information
5) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
6) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.

CAT. NO. 2450

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 1.0.1.6

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sodium Hydroxide Solution 5.0N
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00458

II. INGREDIENTS

Sodium Hydroxide
PCT: <25
CAS NO.: 1310-73-2
SARA: NOT LISTED
TLV: 2 mg/M3
PEL: 2 mg/M3
HAZARD: Corrosive, very toxic

Demineralized Water
PCT: to 100
CAS NO.: 7732-18-5
SARA: NOT LISTED
TLV: Not applicable
PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, colorless ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: ~100C MELTING PT.: NA SPEC GRAVITY: 1.161 pH: ~14
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.59 METAL CORROSIVITY - ALUMINUM: >20 in/yr.
STEEL: 0.00 in/yr. STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: None
HAZARDOUS DECOMP. PRODUCTS: None
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Heat, evaporation; contact with acids

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes and skin
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Burns and ultimate scarring. Can cause serious damage to all body tissues contacted.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Chronic eye or skin conditions

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover spill with citric acid or another solid acidic material. Scoop slurry to beaker. Add water and neutralize liquid to a pH between 6 and 9. Flush neutralized waste to the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Sodium Hydroxide Solution
HAZARD CLASS: 8 ID: UN1824 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Sodium Hydroxide Solution
HAZARD CLASS: 8 ID: UN1824 GROUP: II

I.M.O. PROPER SHIPPING NAME: Sodium Hydroxide, Solution
HAZARD CLASS: 8 ID: UN1824 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) Technical judgment
4) In-house information
5) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
6) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.
7) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989

CAT. NO. 2451

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 165069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Potassium Persulfate
CAS NO.: 7727-21-1
CHEMICAL NAME: Peroxydisulfuric Acid, Dipotassium Salt
FORMULA: K2S2O8 CHEMICAL FAMILY: Oxidizing Agents
MSDS NUMBER: M00039

II. INGREDIENTS

Potassium Persulfate
PCT: 100 CAS NO.: 7727-21-1 SARA: NOT LISTED
TLV: 5 mg/M3 PEL: Not established
HAZARD: Oxidizer; strong eye irritant; allergen

III. PHYSICAL DATA

STATE: solid APPEARANCE: White powder ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: Decomp <100C
SPEC GRAVITY: 2.477 pH: of 5% soln. = 4.1
VAPOR PRESSURE: Not applicable VAPOR DENSITY (air=1): NA
EVAPORATION RATE: NA METAL CORROSIVITY - ALUMINUM: 0.137 in/yr
STEEL: 0.704 in/yr STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA EXTINGUISHING MEDIA: water
FIRE/EXPLOSION HAZARDS: Strong oxidizer, Fire risk in contact with organic materials
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides in fire. Decomposes in air at <100°C
OXIDIZER: strong NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
NFPA Symbol: oxy
CONDITIONS TO AVOID: Heat, flames, excess moisture; contact with reducers, oxidizable or combustible materials

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes and respiratory tract and may cause allergic skin and respiratory reactions.
ACUTE TOXICITY: Oral Rat LD50 = 802 mg/kg = Moderately Toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Causes eye and respiratory tract irritation. May cause allergic skin and respiratory tract reactions.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Allergies or sensitivity to potassium persulfate

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
Keep away from oxidizable material.
PROTECTIVE EQUIPMENT: fume hood, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessar Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: In small batches, dilute with excess water i beaker. Neutralize to a pH between 6 and 9 with soda ash. Flush to drai with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Potassium Persulphate
HAZARD CLASS: 5.1 ID: UN1492 GROUP: III

I.C.A.O. PROPER SHIPPING NAME: Potassium Persulphate
HAZARD CLASS: 5.1 ID: UN1492 GROUP: III

I.M.O. PROPER SHIPPING NAME: Potassium Persulphate
HAZARD CLASS: 5.1 ID: UN1492 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U. S. Department of Health and Human Services, April, 198
3) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
4) In-house information
5) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989
6) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.
7) Technical judgment
8) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
9) Outside testing.

CAT. NO. 12065

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: SulfaVer ® 4 Sulfate Reagent
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00046

II. INGREDIENTS

Barium Chloride
PCT: <50
CAS NO.: 10326-27-9
SARA: LISTED
TLV: 0.5 mg/M3 as Ba
PEL: 0.5 mg/M3 as Ba
HAZARD: Very toxic

Citric Acid, Anhydrous
PCT: <70
CAS NO.: 77-92-9
SARA: NOT LISTED
TLV: Not established
PEL: Not established
HAZARD: Causes severe eye irritation. May cause skin irritation.

III. PHYSICAL DATA

STATE: solid APPEARANCE: White powder ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: ~124°C
SPEC GRAVITY: ~2.8 pH: of 5% soln. ~2 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.379 in/yr STEEL: 0.459 in/yr
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: May react with oxidizers; may emit toxic fumes
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of hydrogen chloride, carbon monoxide in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 1 Reactivity: 0
CONDITIONS TO AVOID: Contact with oxidizers, bromine trifluoride, 2-furan percarboxylic acid, metal nitrates, extreme temperatures, or excess moisture

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Oral rat LD50 = 680 mg/Kg = Moderately toxic
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: central nervous system
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Contact may cause irritation to eyes, skin, or respiratory tract; if swallowed, may cause ulcers and inflammation of stomach and intestines, sedation.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. physician. Flush skin with plenty of water.
INGESTION: Induce vomiting by sticking finger down throat, then give 1 tablespoon of epsom salt in a glass of water. Call physician immediat Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessa Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop up material. Decontaminate site. Dispo of the material in an E.P.A. approved hazardous waste site.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Corrosive Solid, N.O.S. (Citric acid mixtur
HAZARD CLASS: 8 ID: UN1759 GROUP: III

I.C.A.O. PROPER SHIPPING NAME: Corrosive Solid, acidic, organic, N.O.S. (Citric acid mixture)
HAZARD CLASS: 8 ID: UN3261 GROUP: III

I.M.O. PROPER SHIPPING NAME: Corrosive Solid, acidic, organic, N.O.S. (Citric acid mixture)
HAZARD CLASS: 8 ID: UN3261 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988- 1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Outside testing.
6) Vendor information.

SPECIAL NOTE: Oral rat LD50 for this product = 680 mg/Kg

SARA: This product contains a chemical or chemicals subject to the reporti requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

CAT. NO. 12066

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

DOB: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: ChromaVer ® 3
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00001

II. INGREDIENTS

Potassium Pyrosulfate
PCT: <85 CAS NO.: 7790-62-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes eye burns

Magnesium Sulfate Heptahydrate
PCT: <25 CAS NO.: 7487-88-9 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Other component
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: White or light pink powder
ODOR: Not determined SOLUBILITY IN: WATER: Slightly soluble
ACID: Soluble OTHER: Not determined BOILING POINT: NA
MELTING PT.: 215C decomp. SPEC GRAVITY: 2.26 pH: of 5% soln. = 1.1
VAPOR PRESSURE: Not applicable VAPOR DENSITY (air=1): NA
EVAPORATION RATE: NA METAL CORROSIVITY - ALUMINUM: 0.014 in/yr
STEEL: 0.416 in/yr STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Extreme temperatures, excess moisture, exposure to light

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, irritating to respiratory tract
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion
TARGET ORGANS: central nervous system
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is an experimental mutagen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: May cause eye burns, central nervous system depression, respiratory paralysis, death.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye or skin disorders

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes.
Do not breathe dust.
Wash thoroughly after handling.
Protect from moisture
PROTECTIVE EQUIPMENT: fume hood, lab grade goggles, rubber gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. physician. Remove contaminated clothing. Wash skin with soap and plent water.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover contaminated surfaces with soda ash or sodium bicarbonate. Mix and add water if necessary. Use litmus paper make sure pH of slurry is neutral or add neutralizer until mixture stop bubbling. Scoop up the slurry and wash the neutral waste down the drain with excess water. Wash the site with soda ash solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Corrosive Solid, N.O.S. (Potassium Pyrosulphate Mixture)
HAZARD CLASS: 8 ID: UN1759 GROUP: III

I.C.A.O. PROPER SHIPPING NAME: Corrosive Solid, acidic, inorganic, N.O.S. (Potassium Pyrosulphate Mixture)
HAZARD CLASS: 8 ID: UN3260 GROUP: III

I.M.O. PROPER SHIPPING NAME: Corrosive Solid, acidic, inorganic, N.O.S. (Potassium Pyrosulphate Mixture)
HAZARD CLASS: 8 ID: UN3260 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Outside testing.

SPECIAL NOTE: In laboratory tests, when magnesium sulfate was given to pregnant rats, a sharp reduction of both the number and the weight of th offspring was observed.

CAT. NO. 12616

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/18/95
CHANGE NO.: 14905

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

POR: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: DithiVer ® Metals Reagent
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00067

II. INGREDIENTS

Sodium Metabisulfite
PCT: <100 CAS NO.: 7681-57-4 SARA: NOT LISTED
TLV: 5 mg/M3 PEL: 5 mg/M3
IARC: LISTED
HAZARD: May cause irritation; allergen; moderately toxic

Other component
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: Fine gray powder ODOR: of SO2
SOLUBILITY IN: WATER: Very soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: 170°C
SPEC GRAVITY: 2.32 pH: of 5% soln. = 4.2 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.019 in/yr STEEL: 0.004 in/yr
STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May react violently with oxidizers or acids; may emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sodium oxide and sulfur oxides in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Exposure to moisture, oxidizers, aluminum powder or acids. Protect from unnecessary heat and light at all times.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin, respiratory tract, and may cause allergic respiratory tract reaction.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Carcinogenicity testing was inconclusive for an ingredient of this mixture. An ingredient of this mixture is an experimental mutagen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: May be irritating to eyes, skin and respiratory tract. Ingestion may cause stomach irritation, diarrhea, circulatory disturbances, and central nervous system depression. May cause allergic respiratory reaction if swallowed or inhaled.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Respiratory conditions such as asthma

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. C physician. Wash skin with soap and plenty of water.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessary Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop spilled material into a beaker and dissolve with water. Neutralize to a pH between 6 and 9 with an alkali such as soda ash. Flush neutralized waste to the drain with an excess of water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Vendor information.
6) IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, World Health Organization (Volume 54) 1992, France.

SPECIAL NOTE: Sulfites are strong sensitizers. Inhalation and ingestion ma cause allergic respiratory reactions in asthmatics. Persons with respiratory conditions should take special care when working with product that contain sulfites.

CAT. NO. 14032

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 14005

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145049
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: ZincoVer ® 5 Zinc Reagent
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00048

II. INGREDIENTS

Potassium Cyanide
PCT: <5 CAS NO.: 151-50-8 SARA: LISTED
TLV: 5mg/m³ CN (skin) PEL: 5mg/m³ CN (skin)
HAZARD: Extremely toxic; fast-acting; experimental mutagen

Potassium Borate
PCT: <60 CAS NO.: 1332-77-0 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Boron Oxide
PCT: <25 CAS NO.: 1303-86-2 SARA: NOT LISTED
TLV: 10 mg/M3 PEL: 15 mg/M3
HAZARD: Moderately toxic; may cause irritation

Sodium Ascorbate
PCT: <30 CAS NO.: 134-03-2 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Other component
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: Purple powder ODOR: Not determined
SOLUBILITY IN: WATER: Soluble ACID: Generates HCN
OTHER: Not determined BOILING POINT: NA MELTING PT.: 155°C
SPEC GRAVITY: 1.83 pH: of 5% soln = 8.7 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place away from acids.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: carbon dioxide
FIRE/EXPLOSION HAZARDS: Dust may form explosive mixtures with air; may emit toxic fumes of cyanide and boron
HAZARDOUS DECOMP. PRODUCTS: Contact with acid forms cyanide, May emit boron compounds
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Heat, flames, contact with moisture or acids

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes and respiratory tract.
ACUTE TOXICITY: Oral rat LD50 = 383 mg/Kg = Very toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation, skin absorption
TARGET ORGANS: brain
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Irritation; confusion, irregular pulse, coma, death; may be rapidly fatal.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Protect from moisture
Keep away from acids.
Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: fume hood, lab grade goggles, disposable latex glov
lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. C
physician. Wash skin with soap and plenty of water.
INGESTION: Always have on hand a cyanide first aid kit. Break an amyl nitrite pearl in cloth and hold lightly under nose for 15 seconds. Repe every 5 minutes. Administer artificial respiration with 100% oxygen. Transport to hospital immediately.
INHALATION: Always have on hand a cyanide first-aid kit. Break an amyl nitrite pearl in cloth and hold lightly under nose for 15 seconds. Repe 5 times at 15-second intervals. Transport to hospital immediately.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Absorb spill on non-reactive material. Oxidiz the waste with a 50% excess of a mixture of commercially available laund bleach and soda ash or sodium bicarbonate. Allow to react in a well vent area for 24 hours. Drain liquid to sewer with a large excess of water, dispose of absorbant material as normal trash.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Outside testing.

SPECIAL NOTE: A doctor's prescription is required for the purchase of amyl nitrite ampules. Contact your company doctor or local physician to obtain a prescription and determine where to purchase amyl nitrite ampules in your area.

SARA: This product contains a chemical or chemicals subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

CAT. NO.

MSDS DATE:
CHANGE NO.:

CAT. NO. 981

MATERIAL SAFETY DATA SHEET

POS: 145069
HACH 06/06/28:

MSDS DATE: 1/30/95
CHANGE NO.: 15442

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr
(303) 623-5716

I. PROI

PRODUCT NAME
CAS NO.: NA
FORMULA: Not

II. INGR

Lithium Hydr
PCT: <6!
TLV: Not
HAZARD:

Potassium Io
PCT: <4
TLV: Not
HAZARD:

Sodium Azide
PCT: <5
TLV: C:
HAZARD:

III. PHYS

STATE: solid
SOLUBILITY II
OTHER: Not d
SPEC GRAVITY
VAPOR PRESSU
EVAPORATION I
STEEL: ND
STORAGE PREC

IV. FIRE

FLASH PT.: Nc
FLAMMABILITY
SUSCEPTIBILI
SHOCK SENSITI
EXTINGUISHING
FIRE/EXPLOSIO
HAZARDOUS DEC
Irritating
OXIDIZER: No
CONDITIONS TO
oxidizers.

V. HEALT

THIS PRODUCT
ACUTE TOXICIT
ROUTES OF
TARGET ORG
CHRONIC TOXICI
ROUTES OF
TARGET ORG
CANCER INFORM
ROUTES OF
TARGET ORG
OVEREXPOSURE:
depression,
runny nose,
MEDICAL CONDIT
especially t
May lower bl

VI. PRECA

Avoid contact
Do not breath
Wash thoroughl
PROTECTIVE EQU
lab coat

THE INFORMATIO
REGARDING THE

Hach Company,

Not
At we

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Dissolved Oxygen 1 Reagent
CAS NO.: 10034-96-5 CHEMICAL NAME: Manganese Sulfate, Monohydrate
FORMULA: MnSO4·H2O CHEMICAL FAMILY: Inorganic Salts
MSDS NUMBER: M00029

II. INGREDIENTS

Manganous Sulfate Monohydrate
PCT: 100 CAS NO.: 10034-96-5 SARA: LISTED
TLV: 5 mg/m³ as Mn PEL: C: 5 mg/m³ as Mn
HAZARD: Systemic poison by inhalation

III. PHYSICAL DATA

STATE: solid APPEARANCE: Pink powder ODOR: Not determined
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: >400°C
SPEC GRAVITY: ND pH: of 5% soln. = 3.7 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: 0.002 in/yr STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: Use media appropriate to the surrounding fire conditions.
FIRE/EXPLOSION HAZARDS: None reported
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides and manganese oxides in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Extreme temperatures; contact with oxidizers or powdered metals

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: lungs
CHRONIC TOXICITY: Cumulative poison
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: central nervous system, blood
CANCER INFORMATION: experimental mutagen and experimental teratogen
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: Chronic inhalation may cause psychiatric disorders characterized by irritability, difficulty walking, speech disturbances and compulsive behavior. May also cause mask-like facial expression, cirrhosis of the liver, and Parkinson's-like symptoms.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Persons with pre-existing respiratory, liver, or central nervous systems conditions may be more susceptible to the effects of manganese poisoning.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water or milk, sticking finger down throat. Never give anythir unconscious person. Call physician.
INHALATION: Remove to fresh air. Give artificial Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Sweep up powder. Ave Dissolve in water. Flush down the drain with e
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE,

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulat
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regul
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulat
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Ex 1989. American Conference of Governmental Indu
2) Air Contaminants, Federal Register, Vol. 54, N 19, 1989. pp. 2332-2983.
3) Sax, N. Irving. Dangerous Properties of Indus New York: Van Nostrand Reinhold Co. 1984.
4) Gosselin, R.E. et al. Clinical Toxicology of C Ed. Baltimore: The Williams and Wilkins Co.,
5) Technical judgment
6) Vendor information.
7) Casarett and Doull's Toxicology, 3rd Ed. New Publishing Co., Inc. 1986.
8) NIOSH Registry of Toxic Effects of Chemical Su Cincinnati: U. S. Department of Health and Hu
9) List of Dangerous Substances Classified in Ann (67/548) - Classification, Packaging and Label Substances, Ammended November, 1986.

SARA: This product contains a chemical or chemical requirements of section 313 of Title III of the Reauthorization Act of 1986 and 40 CFR Part 372.

CAT. NO. 983

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 12568

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

PO#: 145069
HACH ORDER#: 979671

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Buffer Powder Pillows, Citrate Type, for Manganese
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M80023

II. INGREDIENTS

Sodium Phosphate, Dibasic, Anhydrous
PCT: <55 CAS NO.: 7558-79-4 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye and respiratory tract irritation

Citric Acid, Anhydrous
PCT: <25 CAS NO.: 77-92-9 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes severe eye irritation. May cause skin irritation.

Sodium Sulfate, Anhydrous
PCT: <35 CAS NO.: 7757-82-6 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: White crystalline powder ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Not determined
OTHER: Not determined BOILING POINT: NA MELTING PT.: 160°C
SPEC GRAVITY: 2.38 pH: 6.55 (1%soln @25°C)
VAPOR PRESSURE: Not applicable VAPOR DENSITY (air=1): NA
EVAPORATION RATE: NA METAL CORROSIVITY - ALUMINUM: 0.022 in/yr
STEEL: 0.080 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND EXTINGUISHING MEDIA: water
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire. Closed containers may explode if exposed to heat.
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of phosphorus, sulfur, carbon, and sodium oxide in a fire.
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 1 Reactivity: 0
CONDITIONS TO AVOID: Heat, flames, exposure to moisture

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Slightly toxic
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is an experimental teratogen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: Causes eye irritation, May cause skin and respiratory tract irritation. May cause gastrointestinal irritation, vomiting, lethargy, diarrhea, fever, fluid loss, fall in blood pressure, and may impair the body's ability to absorb calcium.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Caution. Protect from light.
Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: Adequate ventilation, lab grade goggles

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. C physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Sweep up powder. Avoid breathing material. Dissolve in water. Flush down the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U. S. Department of Health and Human Services, April, 198

CAT. NO. 984

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

PO#: 145969
HACH ORDER#: 9

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sodium Periodate for Manganese
CAS NO.: 7790-28-5 CHEMICAL NAME: Sodium Periodate
FORMULA: NaIO4 CHEMICAL FAMILY: Oxidizing Agents
MSDS NUMBER: M00021

II. INGREDIENTS

Sodium m-Periodate
PCT: 100 CAS NO.: 7790-28-5 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Powerful oxidizer; causes irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: White crystalline powder ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: NA MELTING PT.: 300°C decomp SPEC GRAVITY: 3.865
pH: of 5% soln. = 4-4.5 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry place away from oxidizable material.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: Powerful oxidizer; may decompose explosively in case of fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of iodine, iodine compounds and sodium oxides
OXIDIZER: strong NFPA Codes: Health: 2 Flammability: 0 Reactivity: 2
NFPA Symbol: oxy
CONDITIONS TO AVOID: Heat, flames; contact with ammonium compounds, organic material, finely-powdered metals and any other reducers

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Not determined
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Ingestion
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Irritation, Ingestion may cause abdominal pain, vomiting, and diarrhea.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye and skin disorders

VI. PRECAUTIONARY MEASURES

Protect from moisture
Keep away from oxidizable material.
Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, rubber gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and ski
minutes. Remove contaminated clothing. Call physi
INGESTION: Give large quantities of water. Call phy
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: In small batches, dilut
beaker. Neutralize to a pH between 6 and 9 with so
with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AN

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Oxidizing Substances, S
Periodate)
HAZARD CLASS: 5.1 ID: UN1479 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Oxidizing Solid, N.O.S
HAZARD CLASS: 5.1 ID: UN1479 GROUP: II

I.M.O. PROPER SHIPPING NAME: Oxidizing Solid, N.O.S.
HAZARD CLASS: 5.1 ID: UN1479 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Expos
1989. American Conference of Governmental Industr
2) Air Contaminants, Federal Register, Vol. 54, No.
19, 1989. pp. 2332-2983.
3) Sax, N. Irving. Dangerous Properties of Industri
New York: Van Nostrand Reinhold Co. 1984.
4) The Merck Index, 11th Ed. Rahway, New Jersey: M
1989
5) Fire Protection Guide to Hazardous Materials, 10t
National Fire Protection Association, 1991.
6) Technical judgment
7) Vendor information.

CAT. NO. 21194

MATERIAL SAFETY DATA SHEET

POB: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 15040

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Nessler Reagent
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00503

II. INGREDIENTS

Mercuric Iodide
PCT: <15 CAS NO.: 7774-29-0 SARA: LISTED
TLV: 0.05 mg/M3 as Hg PEL: C: 0.1 mg/M3 Hg
RCRA: D009
HAZARD: Extremely toxic; causes severe burns

Sodium Hydroxide
PCT: <20 CAS NO.: 1310-73-2 SARA: NOT LISTED
TLV: 2 mg/M3 PEL: 2 mg/M3
HAZARD: Corrosive, very toxic

Sodium Iodide
PCT: <10 CAS NO.: 7681-82-5 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes moderate eye irritation

Iodine, Resublimed Crystals
PCT: <1 CAS NO.: 7553-56-2 SARA: NOT LISTED
TLV: 0.1 ppm ceiling PEL: 0.1 ppm ceiling
HAZARD: Slightly toxic; causes severe burns

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, light yellow ODOR: Not determined
SOLUBILITY IN: WATER: Miscible ACID: Not determined
OTHER: Not determined BOILING POINT: ND MELTING PT.: NA
SPEC GRAVITY: 1.265 pH: 12.1 VAPOR PRESSURE: Not determined
VAPOR DENSITY (air=1): ND EVAPORATION RATE: ND
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: May emit toxic fumes
HAZARDOUS DECOMP. PRODUCTS: Fumes of mercury, iodine and iodine compounds
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Extreme temperatures, light; contact with acids, organics, ammonia, aldehydes.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes and skin
ACUTE TOXICITY: Extremely toxic
ROUTES OF EXPOSURE: Ingestion
TARGET ORGANS: central nervous system, kidneys
CHRONIC TOXICITY: Cumulative poison
ROUTES OF EXPOSURE: Ingestion, skin absorption
TARGET ORGANS: central nervous system, kidneys, liver
CANCER INFORMATION: An ingredient of this mixture is an experimental teratogen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: Causes severe burns. Mercury is a general protoplasmic poison; it circulates in the blood and is stored in the liver, kidneys, spleen and bones. Main symptoms are sore mouth, tremors and psychic disturbances. May cause CNS effects, brain damage.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: May aggravate allergies or sensitivity to mercury; eye or skin conditions; disorders of the central nervous system or kidneys

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: fume hood, lab grade goggles, disposable latex glov lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: The toxicity of mercury is such that the element and its compounds should not be allowed to contaminate air or water. Soak up solution with inert material. Do not breathe fumes. Decontaminate the area with mercury absorbing compounds available commercially. Dispose of all mercury contaminated material in an EPA approved hazardous waste facility.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Corrosive liquid, N.O.S. (Mercuric Iodide/Sodium Hydroxide Solution)
HAZARD CLASS: 8 ID: UN1760 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Corrosive Liquid, Toxic, N.O.S. (Mercuric Iodide/Sodium Hydroxide Solution)
HAZARD CLASS: 8 ID: UN2922 GROUP: II
SUBSIDIARY RISK: 6.1

I.M.O. PROPER SHIPPING NAME: Corrosive Liquid, Basic, Inorganic, N.O.S. (Mercuric Iodide/Sodium Hydroxide Solution)
HAZARD CLASS: 8 ID: UN3266 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988 1989. American Conference of Governmental Industrial Hygienists, 1988
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Januar 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

SARA: This product contains a chemical or chemicals subject to the report requirements of section 313 of Title III of the Superfund Amendments an Reauthorization Act of 1986 and 40 CFR Part 372.

PER CALIFORNIA PROPOSITION 65: "WARNING - This product contains a chemica known to the State of California to cause cancer, birth defects or othe reproductive harm."

CAT. NO. 21950

MATERIAL SAFETY DATA SHEET

PO#: 145869
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Hach One Reference Electrolyte Solution
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00339

II. INGREDIENTS

Glycerin
PCT: <45 CAS NO.: 56-81-5 SARA: NOT LISTED
TLV: 10 mg/M3 mist PEL: 10 mg/M3 mist
HAZARD: Slightly toxic

Potassium Chloride
PCT: <20 CAS NO.: 7447-40-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Silver Chloride
PCT: <0.1 CAS NO.: 7783-90-6 SARA: LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Other component
PCT: <0.1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, colorless ODOR: Not determined
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: ~99°C MELTING PT.: NA SPEC GRAVITY: 1.21 pH: 6.16
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: ND METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: Emits toxic fumes of acrolein and carbon dioxide
HAZARDOUS DECOMP. PRODUCTS: Decomposes when heated above 290C, forming corrosive acrolein gas
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Extreme temperatures; contact with strong oxidizers such as chromium trioxide, potassium chlorate or potassium permanganate

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes and skin.
ACUTE TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: kidneys
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: May cause slight eye and skin irritation. May cause kidney damage.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. (physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Absorb material on non-reactive material. S up the material and dispose of in an EPA approved hazardous waste facility. Decontaminate site with a soap solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 198 1989. American Conference of Governmental Industrial Hygienists, 198
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janua 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

CAT. NO. 22538

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 14792

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

PO#: 145069
HACH ORDER#: 979671

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Amino Acid F Reagent
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00115

II. INGREDIENTS

Sodium Metabisulfite
PCT: >98
CAS NO.: 7681-57-4
SARA: NOT LISTED
TLV: 5 mg/M3
PEL: 5 mg/M3
IARC: LISTED
HAZARD: May cause irritation; allergen; moderately toxic

Fast Amino Acid (Trade Secret)
PCT: <10
CAS NO.: Confidential
SARA: NOT LISTED
TLV: Not established
PEL: Not established
HAZARD: Very toxic; may cause irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: White to tan powder ODOR: None
SOLUBILITY IN: WATER: Mostly soluble ACID: HCl, H2SO4 solutions
OTHER: NaOH solution BOILING POINT: NA MELTING PT.: > 150°C dec.
SPEC GRAVITY: 2.343 pH: of 5% soln. = 4.3
VAPOR PRESSURE: Not applicable VAPOR DENSITY (air=1): NA
EVAPORATION RATE: NA METAL CORROSIVITY - ALUMINUM: 0.001 in/yr
STEEL: 0.033 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool area, away from acids and oxidizers.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: Contact with steam will produce toxic and corrosive material. Toxic fumes in fire.
HAZARDOUS DECOMP. PRODUCTS: Toxic fumes of SOx and Na2O; contact with steam or acid produces corrosive fumes.
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Contact with steam will produce toxic and corrosive material. Prolonged exposure to air will decompose product. Reacts with acids and oxidizers. Avoid contact with aluminum.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin, respiratory tract, and may cause allergic respiratory tract reaction.
ACUTE TOXICITY: Oral rat LD50 = ~1415 mg/kg = Moderately toxic
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: central nervous system
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined.
CANCER INFORMATION: Carcinogenicity testing was inconclusive for an ingredient of this mixture. An ingredient of this mixture is an experimental mutagen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: May cause irritation. Ingestion can cause stomach irritation, abdominal pain, diarrhea, vomiting, headache, circulatory disturbances and central nervous system depression. May cause allergic respiratory reaction if swallowed or inhaled.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin and respiratory tract conditions. Some asthmatics are said to be dangerously sensitive to minute amounts of sulfites in food.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. physician. Wash skin with soap and plenty of water.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necess Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop spilled material into a beaker and dissolve with water. Neutralize to a pH between 6 and 9 with an alkal such as soda ash. Flush neutralized waste to the drain with an excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 19 1989. American Conference of Governmental Industrial Hygienists, 19
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janu 19, 1989. pp. 2332-2983.
3) In-house information
4) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989
5) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th E New York: Van Nostrand Reinhold Co. 1984.
6) Technical judgment
7) Vendor information.
8) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products, 5t Ed. Baltimore: The Williams and Wilkins Co., 1984.
9) IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, Wo Health Organization (Volume 54) 1992, France.
10) Outside testing.
11) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U. S. Department of Health and Human Services, April, 1

SPECIAL NOTE: Sulfites are strong sensitizers. Inhalation and ingestion cause allergic respiratory reactions in asthmatics. Persons with respiratory conditions should take special care when working with prod that contain sulfites. SPECIAL NOTE: Fast Amino Acid is a trade name e substituted sulfonic acid. SPECIAL NOTE: Oral rat LD50 for this mix is ~1415 mg/kg. SPECIAL NOTE: HMIRC Registry #2819 - 7/10/91

CAT. NO. 22675

MATERIAL SAFETY DATA SHEET

PO#: 145869
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sodium Thiosulfate 0.2000 ± 0.0010N
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00352

II. INGREDIENTS

Sodium Thiosulfate
PCT: <10 CAS NO.: 7772-98-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Other components, each
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear and colorless ODOR: None
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: ~100C MELTING PT.: NA SPEC GRAVITY: 0.996 pH: 7.9
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.74 METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place and protect from sunlight.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: None
HAZARDOUS DECOMP. PRODUCTS: None reported
OXIDIZER: No NFPA Codes: Health: 0 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat and light

V. HEALTH HAZARD DATA

ACUTE TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CHRONIC TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: No effects anticipated
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: lab grade goggles

VII. FIRST AID

EYE AND SKIN CONTACT: Flush with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Dilute with water. Pour down the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 198 1989. American Conference of Governmental Industrial Hygienists, 198
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janua 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

CAT. NO. 22835

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 8765

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

PO#: 145069
HACH ORDER#: 979671

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Buffer Solution pH 7.00 ± 0.02
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00369

II. INGREDIENTS

Potassium Phosphate, Monobasic
PCT: < 5 CAS NO.: 7778-77-0 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Other components, each
PCT: < 1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, yellow solution ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: ~100°C MELTING PT.: NA SPEC GRAVITY: ~1.0
pH: 7.0 @ 25°C VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: ND METAL CORROSIVITY - ALUMINUM: None STEEL: None
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store tightly closed.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: None
HAZARDOUS DECOMP. PRODUCTS: None
OXIDIZER: No NFPA Codes: Health: 0 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, evaporation

V. HEALTH HAZARD DATA

ACUTE TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CHRONIC TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: No effects anticipated
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: lab grade goggles

VII. FIRST AID

EYE AND SKIN CONTACT: Flush with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Dilute with water. Pour down the drain wi
excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 19
1989. American Conference of Governmental Industrial Hygienists, 19
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janu
19, 1989, pp. 2332-2983.
3) In-house information
4) Technical judgment

CAT. NO. 23765

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

PO#: 145869
HACH ORDER#: 979671

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Polyvinyl Alcohol Dispersing Agent
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00527

II. INGREDIENTS

Polyvinyl Alcohol
PCT: <5 CAS NO.: 9002-89-5 SARA: NOT LISTED
TLV: Not established PEL: Not established
IARC: LISTED
HAZARD: May cause irritation; experimental carcinogen

Other components, each
PCT: <0.1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: purple/brown solution ODOR: slight iodine
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: 98 C MELTING PT.: fr. pt. 0C SPEC GRAVITY: 1.0042
pH: 5.4 VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.87 METAL CORROSIVITY - ALUMINUM: 0.001 in/yr
STEEL: 0.019 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: None METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: Not applicable
HAZARDOUS DECOMP. PRODUCTS: Not determined
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Contamination by organic material; heat, flames, light

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes.
ACUTE TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CHRONIC TOXICITY: Danger of cumulative effects
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is an experimental carcinogen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: May cause eye irritation. Chronic overexposures may cause anemia, organ damage.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Dilute with water. Pour down the drain wit excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 198 1989. American Conference of Governmental Industrial Hygienists, 198
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janua 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Vendor information.

CAT. NO. 23766

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/01/95
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Mineral Stabilizer
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00526

II. INGREDIENTS

Sodium Citrate
PCT: < 30 CAS NO.: 68-04-2 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Potassium Sodium Tartrate
PCT: < 30 CAS NO.: 6381-59-5 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation.

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, colorless ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: 98°C MELTING PT.: fr. pt. -8°C SPEC GRAVITY: 1.298
pH: 8.7 VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.65 METAL CORROSIVITY - ALUMINUM: 0.016 in/yr
STEEL: 0.001 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit acrid smoke and fumes
HAZARDOUS DECOMP. PRODUCTS: May emit acrid smoke and fumes in fire
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, oxidizers

V. HEALTH HAZARD DATA

ACUTE TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: No effects anticipated
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. physician. Wash skin with soap and plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Dilute with water. Pour down the drain wit excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 198 1989. American Conference of Governmental Industrial Hygienists, 198
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janua 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Gessner G. Hawley, revised by, The Condensed Chemical Dictionary, Eleventh Ed., New York: Van Nostrand Reinhold Co., 1987

MATERIAL SAFETY DATA SHEET

ience, Contact:
atory Affairs Dept.
x 907 Ames, IA 50010
) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145869
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

NAME: Not applicable
FAMILY: Not applicable

-9 SARA: LISTED
PEL: Ci 5 mg/M3 as Mn

-6 SARA: LISTED
PEL: 5 mg/M3 ZnO fume

3 SARA: NOT LISTED
PEL: 2 mg/M3 ceiling

6 SARA: LISTED
PEL: 0.05 mg/M3 skin

skin absorption

: None
:nsoluble OTHER: Not determined
C GRAVITY: NA pH: Not applicable
SITY (g/ml): NA
- ALUMINUM: None STEEL: None

..TIVITY DATA

NA
lcohol foam or carbon dioxide
the chemical ingredients or

fumes in fire
mability: 0 Reactivity: 1

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Dispose of in an approved chemical landfill. DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) Vendor information.

SPECIAL NOTE: This sheet is provided for your information only. This battery is an article and, as such, is not subject to the OSHA Hazard Communication Standard requirement for preparation of a material safety data sheet. As an article, this battery and its contents are not subject to the requirements of the Emergency Planning and Community Right-To-Know Act.

CAT. NO. 45185

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

POB: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Lead-acid Battery, 8 Volt
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable

II. INGREDIENTS

Lead
PCT: 58 CAS NO.: 7439-92-1 SARA: LISTED
TLV: 0.15 mg/M3 PEL: 0.05 mg/M3
RCRA: D008
HAZARD: Cumulative poison

Lead Oxide
PCT: 25 CAS NO.: 1317-36-8 SARA: LISTED
TLV: 0.15 mg/M3 as Pb PEL: 0.05 mg/M3 as Pb
HAZARD: Poisonous

Sulfuric Acid
PCT: <18 CAS NO.: 7664-93-9 SARA: LISTED
TLV: 1 mg/M3 PEL: 1 mg/M3
IARC: LISTED
HAZARD: Causes severe burns. Harmful if inhaled. Known carcinogen

Demineralized Water
PCT: <15 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Other components, each
PCT: <10 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: Battery ODOR: None
SOLUBILITY IN: WATER: Insoluble ACID: Insoluble OTHER: Not determined
BOILING POINT: NA MELTING PT.: NA SPEC GRAVITY: NA pH: Not applicable
VAPOR PRESSURE: Not applicable VAPOR DENSITY (air=1): NA
EVAPORATION RATE: NA METAL CORROSIVITY - ALUMINUM: NA STEEL: NA
STABILITY: Stable
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: water, dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: Burning may release the chemical ingredients or their combustion products
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 1
CONDITIONS TO AVOID: Flames

V. HEALTH HAZARD DATA

ACUTE TOXICITY: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CHRONIC TOXICITY: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
CANCER INFORMATION: An ingredient of this mixture is a recognized carcinogen and an experimental mutagen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: No effects anticipated
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None

VI. PRECAUTIONARY MEASURES

Not applicable

PROTECTIVE EQUIPMENT: Not applicable

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Dispose of in an approved chemical landfill
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Regulated Domestically
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Battery, Wet, Non-Spillable
HAZARD CLASS: 8 ID: UN2800 GROUP: III

I.M.O. PROPER SHIPPING NAME: Battery, Wet, Non-Spillable
HAZARD CLASS: 8 ID: UN2800 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 198 1989. American Conference of Governmental Industrial Hygienists, 198
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janua 19, 1989. pp. 2332-2983.
3) Vendor information.
4) IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans World Health Organization (Volumes 1-42) Supplement 7, 1987, France.
5) IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, Wor Health Organization (Volume 54) 1992, France.

SPECIAL NOTE: THIS SHEET IS PROVIDED FOR YOUR INFORMATION ONLY. THIS BATTERY IS AN "Article" AS DEFINED IN OSHA's HAZARD COMMUNICATION STAND (29CFR1910.1200). As an article, this battery and its contents are not subject to the requirements of the Emergency Planning and Community Rig To-Know Act. The IARC evaluation of sulfuric acid was based on exposure to the mist or vapor of concentrated sulfuri acid generated during chemical processes.

PER CALIFORNIA PROPOSITION 65: "WARNING - This product contains a chemica known to the State of California to cause cancer, birth defects or othe reproductive harm."

CAT. NO. 14380

MATERIAL SAFETY DATA SHEET

MSDS DATE: 9/12/95
CHANGE NO.: 87-5

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sodium Hydroxide 3.636 ± 0.020 N
CAS NO.: NA
FORMULA: Not applicable
CHEMICAL NAME: Not applicable
CHEMICAL FAMILY: Not applicable

II. INGREDIENTS

Sodium Hydroxide
PCT: <15 CAS NO.: 1310-73-2 SARA: NOT LISTED
TLV: 2 mg/M3 PEL: 2 mg/M3
HAZARD: Corrosive, very toxic

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, colorless ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: ~100C MELTING PT.: NA SPEC GRAVITY: 1.136 pH: ~14
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.26 METAL CORROSIVITY - ALUMINUM: >20 in/yr.
STEEL: 0.88 in/yr. STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: Contact with strong acids may generate enough heat to ignite combustibles
HAZARDOUS DECOMP. PRODUCTS: None
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, evaporation; contact with strong acids, flammable liquids, organic halogen compounds, aluminum, tin, zinc, nitromethane, other nitro compounds

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes and skin
ACUTE TOXICITY: Very toxic
ROUTES OF EXPOSURE: Ingestion
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: Causes burns to all body tissues contacted.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Chronic eye or skin conditions

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. Give artificial respiration if necessa Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover spill with citric acid or another sol acidic material. Scoop slurry to beaker. Add water and neutralize liqu to a pH between 6 and 9. Flush neutralized waste to the drain with exc water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Sodium Hydroxide Solution
HAZARD CLASS: 8 ID: UN1824 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Sodium Hydroxide Solution
HAZARD CLASS: 8 ID: UN1824 GROUP: II

I.M.O. PROPER SHIPPING NAME: Sodium Hydroxide, Solution
HAZARD CLASS: 8 ID: UN1824 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988 1989. American Conference of Governmental Industrial Hygienists, 1988
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Januar 19, 1989. pp. 2332-2983.
3) Technical judgment
4) In-house information
5) Fire Protection Guide to Hazardous Materials, 10th Ed., Quincy, MA; National Fire Protection Association, 1991.
6) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th Ed. New York: Van Nostrand Reinhold Co. 1984.

CAT. NO. 14388

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 14757

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sulfuric Acid 0.1600 ± 0.0005 N
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00337

II. INGREDIENTS

Sulfuric Acid
PCT: <1 CAS NO.: 7664-93-9 SARA: LISTED
TLV: 1 mg/M3 PEL: 1 mg/M3
IARC: LISTED
HAZARD: Causes severe burns. Harmful if inhaled. Known carcinogen

Other components, each
PCT: <0.1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear and colorless ODOR: None
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: 100°C MELTING PT.: NA SPEC GRAVITY: 0.998 pH: 1.1
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.56 METAL CORROSIVITY - ALUMINUM: 0.124 in/yr
STEEL: 0.027 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: None
HAZARDOUS DECOMP. PRODUCTS: None
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Extreme temperatures

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes.
ACUTE TOXICITY: Practically non-toxic
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is a known carcinogen.
ROUTES OF EXPOSURE: inhalation
TARGET ORGANS: nasal cavity, paranasal sinus, lungs, larynx
OVEREXPOSURE: May cause eye irritation.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Call physician.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover the spill with excess soda ash or sodium bicarbonate. Scoop slurry to beaker. Adjust pH to between 6 and 9. Flush to the drain with excess water. Wash site with an alkali solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) Technical judgment
4) In-house information
5) IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, World Health Organization (Volume 54) 1992, France.

SPECIAL NOTE: The IARC evaluation was based on exposure to the mist or vapor of concentrated sulfuric acid generated during chemical process.

SARA: This product contains a chemical or chemicals subject to the report requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

CAT. NO. 14389

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 14771

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Sulfuric Acid 1.600 ± 0.005N
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00299

II. INGREDIENTS

Sulfuric Acid
PCT: <10 CAS NO.: 7664-93-9 SARA: LISTED
TLV: 1 mg/M3 PEL: 1 mg/M3
IARC: LISTED
HAZARD: Causes severe burns. Harmful if inhaled. Known carcinogen

Other component
PCT: <0.1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear and colorless ODOR: None
SOLUBILITY IN: WATER: Miscible ACID: Miscible OTHER: Not determined
BOILING POINT: ~100°C MELTING PT.: NA SPEC GRAVITY: 1.047 pH: <0.5
VAPOR PRESSURE: Not determined VAPOR DENSITY (air=1): ND
EVAPORATION RATE: 0.53 METAL CORROSIVITY - ALUMINUM: Corrosive
STEEL: 0.096 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: Not applicable
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides in fire
OXIDIZER: No NFPA Codes: Health: 3 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, caustics, excessive exposure to air

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, skin and respiratory tract.
ACUTE TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Teeth erosion, Chronic inflammation or ingestion.
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is a known carcinogen.
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: nasal cavity, paranasal sinus, lungs, larynx
OVEREXPOSURE: Causes burns. May cause vomiting and diarrhea if ingested. Breathing sulfuric acid mist or vapor may cause erosion of teeth, mouth soreness and difficulty in breathing.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Fumes may aggravate eye, skin and respiratory conditions.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes, skin and clothing
Do not breathe mist or vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes and skin with water for 15 minutes. Remove contaminated clothing. Call physician.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover the spill with excess soda ash or sodi bicarbonate. Scoop slurry to beaker. Adjust pH to between 6 and 9. Flus to the drain with excess water. Wash site with an alkali solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN1830 GROUP: II

I.C.A.O. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN2796 GROUP: II

I.M.O. PROPER SHIPPING NAME: Sulphuric Acid Solution
HAZARD CLASS: 8 ID: UN2796 GROUP: II

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) Technical judgment
4) In-house information
5) IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, World Health Organization (Volume 54) 1992, France.

SPECIAL NOTE: The IARC evaluation was based on exposure to the mist or vap of concentrated sulfuric acid generated during chemical processes.

SARA: This product contains a chemical or chemicals subject to the reporti requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

CAT. NO. 14399

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 13876

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: EDTA Tetrasodium Salt 0.080 ± 0.004 M
CAS NO.: NA
CHEMICAL NAME: Not applicable
FORMULA: Not applicable
CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00449

II. INGREDIENTS

Ethylenediaminetetraacetic Acid, Tetrasodium Salt
PCT: <40 CAS NO.: 64-02-8 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately Toxic; May cause irritation

Other component
PCT: <0.1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Demineralized Water
PCT: to 100 CAS NO.: 7732-18-5 SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: None

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Clear, light yellow-gold ODOR: None
SOLUBILITY IN: WATER: Miscible ACID: Not determined
OTHER: Not determined BOILING POINT: ~100°C MELTING PT.: NA
SPEC GRAVITY: 1.160 pH: 10.2 VAPOR PRESSURE: Not determined
VAPOR DENSITY (air=1): ND EVAPORATION RATE: 1.1
METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store tightly closed.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of nitrogen oxides and sodium oxide in fire
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Evaporation and extreme temperatures

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes and skin.
ACUTE TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: May cause irritation. Ingestion of very large doses may cause calcium deficiency in the blood, gastrointestinal irritation, fever, muscular cramps and kidney damage.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: accurate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Not applicable

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Cover the spill with excess soda ash or so bicarbonate. Scoop slurry to beaker. Adjust pH to between 6 and 9. Fl to the drain with excess water. Wash site with an alkali solution.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 19 1989. American Conference of Governmental Industrial Hygienists, 19
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janu 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

Cat. No. 21156

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Chloroform
CAS NO.: 67-66-3
FORMULA: CHCl3
MSDS NUMBER: M00198
CHEMICAL NAME: Trichloromethane
CHEMICAL FAMILY: Organic Halogens

II. INGREDIENTS

Chloroform
PCT: 100
TLV: 10 ppm
CAS NO.: 67-66-3
IARC: LISTED
SARA: LISTED
PEL: 2 ppm
NTP: LISTED
HAZARD: Very toxic; experimental carcinogen; Vapors harmful

III. PHYSICAL DATA

STATE: liquid APPEARANCE: Heavy, volatile, colorless ODOR: ether-like
SOLUBILITY IN: WATER: Slightly soluble ACID: Not determined
OTHER: ale, benzene, ether, CCl4, CS2 BOILING POINT: 61C
MELTING PT.: -64C SPEC GRAVITY: 1.474 pH: Not determined
VAPOR PRESSURE: 10 mm @ 10.4C VAPOR DENSITY (air=1): 4.1
EVAPORATION RATE: ND METAL CORROSIVITY - ALUMINUM: ND STEEL: ND
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store tightly closed and protected from light.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: None UPPER: None
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: dry chemical, alcohol foam or carbon dioxide
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of chlorides, carbon monoxide and phosgene in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Exposure to light and air; contact with strong alkalies or active metals such as aluminum, magnesium, sodium or potassium, lithium, disilane, mixing with acetone and caustics.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Oral human LDLo = 140 mg/kg = Very toxic; Oral rat LD50 = 908 mg/kg; Inhal rat LC50 = 75 g/m3/1Hr
ROUTES OF EXPOSURE: Ingestion, Inhalation
TARGET ORGANS: central nervous system, liver, kidneys
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: experimental carcinogen
ROUTES OF EXPOSURE: Inhalation
TARGET ORGANS: liver, kidneys, thyroid
OVEREXPOSURE: May cause moderate eye, mild skin, respiratory tract irritation; May cause headache, drowsiness, vomiting, dizziness, pain, unconsciousness, irregular heartbeat, liver and kidney damage, death.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Diseases of the liver, kidneys and central nervous system; simultaneous exposure to chloroform and alcohol can increase the toxic hazards of chloroform.

VI. PRECAUTIONARY MEASURES

Caution. Protect from light.
Store in tightly closed container.
Avoid contact with eyes, skin and clothing
Do not breathe vapor.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: fume hood, lab grade goggles, rubber gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. physician. Wash skin with soap and plenty of water.
INGESTION: Do not induce vomiting. Call physician immediately.
INHALATION: Remove to fresh air. Give artificial respiration if necess Call physician.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Stop material from going to drain or environment. Collect all spilled material and decontaminate spill area Dispose of material in an EPA approved hazardous waste facility.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Chloroform
HAZARD CLASS: 6.1 ID: UN1888 GROUP: III

I.C.A.O. PROPER SHIPPING NAME: Chloroform
HAZARD CLASS: 6.1 ID: UN1888 GROUP: III

I.M.O. PROPER SHIPPING NAME: Chloroform
HAZARD CLASS: 6.1 ID: UN1888 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 198 1989. American Conference of Governmental Industrial Hygienists, 198
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Januar 19, 1989. pp. 2332-2983.
3) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th E New York: Van Nostrand Reinhold Co. 1984.
4) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989
5) NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards. Cincinnati: Department of Health and Human Services, 1981.
6) Technical judgment
7) IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans World Health Organization (Volumes 1-42) Supplement 7, 1987, France.
8) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984.
9) Vendor information.
10) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U. S. Department of Health and Human Services, April, 19
11) List of Dangerous Substances Classified in Annex I of the EEC Directi (67/548) - Classification, Packaging and Labelling of Dangerous Substances, Ammended November, 1986.

SARA: This product contains a chemical or chemicals subject to the report requirements of section 313 of Title III of the Superfund Amendments an Reauthorization Act of 1986 and 40 CFR Part 372.

PER CALIFORNIA PROPOSITION 65: "WARNING - This product contains a chemical known to the State of California to cause cancer."

CAT. NO. 14548

MATERIAL SAFETY DATA SHEET

MSDS DATE: 1/01/95
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

PO#: 145069
HACH ORDER#: 979671

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Citric Acid
CAS NO.: 77-92-9
CHEMICAL NAME: 2-Hydroxy-1,2,3-Propanetricarboxylic Acid
FORMULA: $C_6H_8O_7$ CHEMICAL FAMILY: Organic Acids
MSDS NUMBER: M08072

II. INGREDIENTS

Citric Acid
PCT: 100 CAS NO.: 77-92-9 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes severe eye irritation

III. PHYSICAL DATA

STATE: solid APPEARANCE: Colorless crystals ODOR: None
SOLUBILITY IN: WATER: 60% @ 20°C ACID: Not determined
OTHER: Alcohol, ether BOILING POINT: NA MELTING PT.: 153°C
SPEC GRAVITY: 1.54 pH: of 0.1 N Soln = 2.2
VAPOR PRESSURE: Not applicable VAPOR DENSITY (air=1): NA
EVAPORATION RATE: NA METAL CORROSIVITY - ALUMINUM: 0.000 in/yr
STEEL: 0.493 in/yr STABILITY: Stable
STORAGE PRECAUTIONS: Store tightly closed in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: Potentially explosive reaction with metal nitrates. Emits toxic fumes of CO and CO2.
HAZARDOUS DECOMP. PRODUCTS: Emits acrid smoke and fumes in fire
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 1 Reactivity: 0
CONDITIONS TO AVOID: Exposure to flames, moisture, oxidizers. Potentially explosive reaction in contact with metal nitrates.

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: Irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Oral rat LD50 = 6730 mg/Kg = Slightly toxic
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: May cause severe eye and moderate skin irritation. May cause respiratory tract irritation. Chronic overexposure may cause effects due to ability of citric acid to chelate metals, which could impair body's ability to absorb calcium and iron.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye, skin and respiratory tract conditions.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, rubber gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop spilled material into a beaker and dissolve with water. Neutralize to a pH between 6 and 9 with an acid such as soda ash. Flush neutralized waste to the drain with an excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Corrosive Solid, N.O.S. (Citric acid)
HAZARD CLASS: 8 ID: UN1759 GROUP: III

I.C.A.O. PROPER SHIPPING NAME: Corrosive Solid, acidic, organic, N.O.S. (Citric acid)
HAZARD CLASS: 8 ID: UN3261 GROUP: III

I.M.O. PROPER SHIPPING NAME: Corrosive Solid, acidic, organic, N.O.S. (Citric acid)
HAZARD CLASS: 8 ID: UN3261 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 19
1989. American Conference of Governmental Industrial Hygienists, 19
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, Janua
19, 1989. pp. 2332-2983.
3) The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc.,
1989
4) In-house information
5) Gessner G. Hawley, revised by, The Condensed Chemical Dictionary,
Eleventh Ed., New York: Van Nostrand Reinhold Co., 1987
6) Sax, N. Irving. Dangerous Properties of Industrial Materials, 6th E
New York: Van Nostrand Reinhold Co. 1984.
7) Technical judgment
8) Patty, Frank A. Industrial Hygiene and Toxicology, 3rd Revised Edit
Volume 2. New York; A Wiley-Interscience Publication, 1981.
9) NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86.
Cincinnati: U. S. Department of Health and Human Services, April, 1

CAT. NO. 14550

MATERIAL SAFETY DATA SHEET

PO#: 145069
HACH ORDER#: 979671

MSDS DATE: 1/11/95
CHANGE NO.: 8745

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: Bromphenol Blue Indicator
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable

II. INGREDIENTS

Potassium Chloride
PCT: >98 CAS NO.: 7447-40-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause eye irritation

Bromphenol Blue
PCT: <1 CAS NO.: 115-39-9 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: May cause irritation

Other component
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: Orange-red powder ODOR: None
SOLUBILITY IN: WATER: Soluble ACID: Soluble OTHER: Not determined
BOILING POINT: NA MELTING PT.: 279C decomp. SPEC GRAVITY: 1.98
pH: 10% soln. = 3.7 VAPOR PRESSURE: Not applicable
VAPOR DENSITY (air=1): NA EVAPORATION RATE: NA
METAL CORROSIVITY - ALUMINUM: NA STEEL: NA
STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: NA
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic chloride fumes in fire
OXIDIZER: No NFPA Codes: Health: 1 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Heat, moisture; contact with bromine trifluoride, (sulfuric acid + potassium permanganate)

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: irritating to eyes, skin and respiratory tract.
ACUTE TOXICITY: Not determined
ROUTES OF EXPOSURE: Ingestion, inhalation
TARGET ORGANS: Not determined
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: Not applicable
ROUTES OF EXPOSURE: Not applicable
TARGET ORGANS: Not applicable
OVEREXPOSURE: May cause irritation, stomach disturbances, weakness, circulatory and heart problems
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Persons with impaired kidney function may be more susceptible to the effects of potassium chloride

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin.
Do not breathe dust.
Wash thoroughly after handling.
PROTECTIVE EQUIPMENT: adequate ventilation, lab grade goggles, disposable latex gloves

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. Call physician. Flush skin with plenty of water.
INGESTION: Give large quantities of water. Call physician immediately.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Sweep up powder. Avoid breathing material. Dissolve in water. Flush down the drain with excess water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.C.A.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

I.M.O. PROPER SHIPPING NAME: Not Currently Regulated
HAZARD CLASS: NA ID: NA GROUP: NA

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industriel Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment

TABLE 1

Groundwater Characteristics

Extraction Well Sampling Event

TABLE 1

GROUNDWATER CHARACTERISTICS - EXTRACTION WELL SAMPLING EVENT

EASTERN PLUME, BRUNSWICK, MAINE
OHM PROJECT #16527

EW-1

GALLON PURGED	TEMPERATURE (C)	CONDUCTIVITY (UMHOS)	DISSOLVED OXYGEN (%)	SALINITY (%)	pH
0	7.3	120	2.50	0.5	8.5
147	7.6	120	1.85	0.5	8.7
294	7.7	120	1.92	0.5	8.7
441	7.7	120	1.89	0.5	8.7

DEPTH TO WATER - 1.01' Below TOC

EW-2

GALLON PURGED	TEMPERATURE (C)	CONDUCTIVITY (UMHOS)	DISSOLVED OXYGEN (%)	SALINITY (%)	pH
0	7.5	90	3.46	0.5	9.8
133	7.9	80	4.10	0.5	9.8
266	7.9	80	4.25	0.5	9.8
399	7.9	80	4.20	0.5	9.8

DEPTH TO WATER - 0.89' Below TOC

EW-3

GALLON PURGED	TEMPERATURE (C)	CONDUCTIVITY (UMHOS)	DISSOLVED OXYGEN (%)	SALINITY (%)	pH
0	5.9	55	7.20	0.5	7.9
86	6.2	55	6.50	0.5	7.8
172	6.9	55	6.40	0.5	7.8
258	6.8	55	6.60	0.5	7.9

DEPTH TO WATER - 8.82' Below TOC

TOC = Top of Casing

TABLE 1 (Cont.)

GROUNDWATER CHARACTERISTICS - EXTRACTION WELL SAMPLING EVENT

EASTERN PLUME, BRUNSWICK, MAINE
OHM PROJECT #16527

EW-4					
GALLONS PURGED	TEMPERATURE (C)	CONDUCTIVITY (UMHOS)	DISSOLVED OXYGEN (%)	SALINITY (%)	pH
0	7.1	55	6.60	0.5	9.91
102	7.6	60	6.50	0.5	9.7
204	7.7	70	4.60	0.5	9.3
306	7.9	70	5.10	0.5	9.3
408	7.7	70	4.50	0.5	9.3

DEPTH TO WATER - 0.86' Below TOC

EW-5					
GALLONS PURGED	TEMPERATURE (C)	CONDUCTIVITY (UMHOS)	DISSOLVED OXYGEN (%)	SALINITY (%)	pH
0	6.0	80	3.70	0.5	8.3
125	6.0	80	3.80	0.5	8.3
250	6.5	80	3.10	0.5	8.3
375	7.1	81	3.16	0.5	8.3

DEPTH TO WATER - 4.10' Below TOC

EW-6					
GALLONS PURGED	TEMPERATURE (C)	CONDUCTIVITY (UMHOS)	DISSOLVED OXYGEN (%)	SALINITY (%)	pH
0	6.3	440	3.74	1.0	6.2
56	8.2	460	3.84	1.0	6.4
112	7.9	450	4.01	1.0	6.3
168	8.0	450	4.20	1.0	6.3
224	8.1	450	4.00	1.0	6.2

DEPTH TO WATER - 13.20' Below TOC

TOC = TOP OF CASING

TABLE 1 (Cont.)

GROUNDWATER CHARACTERISTICS - EXTRACTION WELL SAMPLING EVENT

EASTERN PLUME, BRUNSWICK, MAINE
OHM PROJECT #16527

EW-7					
GALLON PURGED	TEMPERATURE (C)	CONDUCTIVITY (UMHOS)	DISSOLVED OXYGEN (%)	SALINITY (%)	pH
0	5.0	270	7.70	0.5	6.5
27	7.3	440	6.80	1.0	6.4
54	8.0	470	6.25	1.0	6.3
81	9.0	500	2.60	1.0	6.3
108	9.8	500	3.10	1.0	6.3
135	9.8	500	2.60	1.0	6.3

DEPTH TO WATER - 21.00' Below TOC

TOC = TOP OF CASING

TABLE 2

Summary of Detected Compounds

TABLE 2

SUMMARY OF DETECTED COMPOUNDS

EASTERN PLUME, BRUNSWICK, MAINE
OHM PROJECT # 16527

		SAMPLE IDENTIFICATION NUMBER						
PARAMETER	**UNITS**	**EW-1**	**EW-2**	**EW-3**	**EW-4**	**EW-5**	**EW-6**	**EW-7**
Aluminum	mg/l	0.11	0.14	<0.10	0.26	<0.10	<0.10	0.12
Antimony	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	mg/l	0.008	<0.005	0.013	0.01	0.008	0.15	0.04
Beryllium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium	mg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Calcium	mg/l	11	14	7.9	3.5	8.4	45	87
Chromium	mg/l	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Cobalt	mg/l	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Copper	mg/l	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Cyanide	ug/l	<20	<20	<20	<20	<20	<20	<20
Iron	mg/l	0.92	0.53	1.4	0.83	0.31	170	43
Lead	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.25	0.022
Magnesium	mg/l	6.1	2.8	1.5	1.8	3.9	3	12
Manganese	mg/l	0.054	0.052	0.01	0.018	0.091	1.1	0.96
Mercury	ug/l	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Nickel	mg/l	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Potassium	mg/l	2.1	1.2	2.1	0.51	1.7	4.9	6.5
Selenium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/l	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Sodium	mg/l	21	7.9	2.7	4.8	9.6	3	11
Thallium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	mg/l	<0.025	<0.025	<0.025	<0.025	<0.025	0.06	<0.025
Zinc	mg/l	1.3	1.1	0.86	0.61	0.71	22	13

TABLE 2 continued

SUMMARY OF DETECTED COMPOUNDS

EASTERN PLUME, BRUNSWICK, MAINE
OHM PROJECT # 16527

		SAMPLE IDENTIFICATION NUMBER						
PARAMETER	UNITS	EW-1	EW-2	EW-3	EW-4	EW-5	EW-6	EW-7
Chloromethane	ug/l	<10	<10	<10	<10	<10	<10	<10
Bromomethane	ug/l	<10	<10	<10	<10	<10	<10	<10
Vinyl chloride	ug/l	<10	<10	<10	<10	<10	<10	<10
Chloroethane	ug/l	<10	<10	<10	<10	<10	11	290
Methylene chloride	ug/l	J2	<10	JB3	<10	J4	<10	J2
Acetone	ug/l	<15	<15	<15	<15	<15	<15	J5
Carbon disulphide	ug/l	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	ug/l	<5	J4	<5	<5	61	<5	<5
1,1-Dichloroethane	ug/l	<5	J2	<5	<5	14	J2	39
Total 1,2-Dichloroethene	ug/l	<5	<5	<5	<5	J4	J1	J3
Chloroform	ug/l	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5	<5	J3	<5	J1
2-Butanone	ug/l	<15	<15	<15	<15	<15	<15	<15
1,1,1-Trichloroethane	ug/l	J1	74	<5	<5	940	<5	J1
Carbon tetrachloride	ug/l	<5	<5	<5	<5	<5	<5	<5
Vinyl acetate	ug/l	<15	<15	<15	<15	<15	<15	<15
Bromodichloromethane	ug/l	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5	<5	<5	<5	<5
cis-1,3-Dichloropropene	ug/l	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	ug/l	J1	25	<5	<5	190	<5	6
Dibromochloromethane	ug/l	<5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5	<5	<5	<5	9
Benzene	ug/l	<5	<5	<5	<5	<5	5	<5
trans-1,3-Dichloropropene	ug/l	<5	<5	<5	<5	<5	<5	<5
Bromoform	ug/l	<5	<5	<5	<5	<5	<5	<5
4-Methyl-2-pentanone	ug/l	<15	<15	<15	<15	<15	<15	<15
2-Hexanone	ug/l	<15	<15	<15	<15	<15	<15	<15
Tetrachloroethene	ug/l	<5	J2	J1	<5	J4	<5	<5
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5	<5	<5	<5	B74
Toluene	ug/l	<5	<5	<5	<5	J1	27	35
Chlorobenzene	ug/l	<5	<5	<5	<5	<5	J4	J1
Ethylbenzene	ug/l	<5	<5	<5	<5	<5	150	18
Styrene	ug/l	<5	<5	<5	<5	<5	<5	<5
Total Xylenes	ug/l	<5	<5	<5	<5	<5	410	49

TABLE 2 continued

SUMMARY OF DETECTED COMPOUNDS

EASTERN PLUME, BRUNSWICK, MAINE
OHM PROJECT # 16527

		SAMPLE IDENTIFICATION NUMBER		
PARAMETER	**UNITS**	**DUP-1**	**DUP-2**	**EQUIP BIANK**
Aluminum	mg/l	<0.10	0.1	<0.10
Antimony	mg/l	<0.005	<0.005	<0.005
Arsenic	mg/l	<0.005	<0.005	<0.005
Barium	mg/l	0.009	<0.005	<0.005
Beryllium	mg/l	<0.005	<0.005	<0.005
Cadmium	mg/l	<0.010	<0.010	<0.010
Calcium	mg/l	9.7	13	<0.050
Chromium	mg/l	<0.015	<0.015	<0.015
Cobalt	mg/l	<0.030	<0.030	<0.030
Copper	mg/l	<0.025	<0.025	<0.025
Cyanide	ug/l	<20	<20	<20
Iron	mg/l	0.8	0.29	<0.025
Lead	mg/l	<0.005	<0.005	<0.005
Magnesium	mg/l	5.4	2.7	<0.050
Manganese	mg/l	0.048	0.049	<0.005
Mercury	ug/l	<0.20	<0.20	<0.20
Nickel	mg/l	<0.040	<0.040	<0.040
Potassium	mg/l	2.1	1.2	<0.50
Selenium	mg/l	<0.005	<0.005	<0.005
Silver	mg/l	<0.015	<0.015	<0.015
Sodium	mg/l	19	7.6	<0.10
Thallium	mg/l	<0.005	<0.005	<0.005
Vanadium	mg/l	<0.025	<0.025	<0.025
Zinc	mg/l	1.5	0.93	<0.025

TABLE 2 continued

SUMMARY OF DETECTED COMPOUNDS

EASTERN PLUME, BRUNSWICK, MAINE
OIIM PROJECT # 16527

		SAMPLE IDENTIFICATION NUMBER			
PARAMETER	UNITS	DUP-1	DUP-2	EQUIP. BLANK	TRIP BLANK
Chloromethane	ug/l	<10	<10	<10	<10
Bromomethane	ug/l	<10	<10	<10	<10
Vinyl chloride	ug/l	<10	<10	<10	<10
Chloroethane	ug/l	<10	<10	<10	<10
Methylene chloride	ug/l	JB1	<10	JB3	JB5
Acetone	ug/l	<15	<15	J4	<15
Carbon disulphide	ug/l	<10	<10	<10	<10
1,1-Dichloroethene	ug/l	<5	J2	<5	<5
1,1-Dichloroethane	ug/l	<5	J3	<5	<5
Total 1,2-Dichloroethene	ug/l	<5	<5	<5	<5
Chloroform	ug/l	<5	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5	<5
2-Butanone	ug/l	<15	<15	<15	<15
1,1,1-Trichloroethane	ug/l	J2	91	<5	<5
Carbon tetrachloride	ug/l	<5	<5	<5	<5
Vinyl acetate	ug/l	<15	<15	<15	<15
Bromodichloromethane	ug/l	<5	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5	<5
cis-1,3-Dichloropropene	ug/l	<5	<5	<5	<5
Trichloroethene	ug/l	J1	30	<5	<5
Dibromochloromethane	ug/l	<5	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5	<5
Benzene	ug/l	<5	<5	<5	<5
trans-1,3-Dichloropropene	ug/l	<5	<5	<5	<5
Bromoform	ug/l	<5	<5	<5	<5
4-Methyl-2-pentanone	ug/l	<15	<15	<15	<15
2-Hexanone	ug/l	<15	<15	<15	<15
Tetrachloroethene	ug/l	<5	J3	<5	<5
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5	<5
Toluene	ug/l	<5	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5	<5
Ethylbenzene	ug/l	<5	<5	<5	<5
Styrene	ug/l	<5	<5	<5	<5
Total Xylenes	ug/l	<5	<5	<5	<5

NOTE:
EW - Extraction Well
mg/L - milligrams per liter
ug/L - micrograms per liter
DUP - duplicate
J - an estimated value less than the laboratory's Practical Quantitation level
- detected in the laboratory method blank analyzed concurrently

ANALYTICAL RESULTS

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-1
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	0.11	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/10/95	KW	2
Barium, Total	0.008	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	11.	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	0.92	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Lead, Total	<0.005	mg/L	1.0	0.005	239.2/7421	03/09/95	KW	2
Magnesium, Total	6.1	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	0.054	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/08/95 by WD using 3010
(2) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC08ICW1

Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-1
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	2.1	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	21.	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	1.3	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC09HGW1

241 Court Road • P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-1
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

340 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-2
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	0.14	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/10/95	KW	2
Barium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	14.	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	0.53	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Lead, Total	<0.005	mg/L	1.0	0.005	239.2/7421	03/09/95	KW	2
Magnesium, Total	2.8	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	0.052	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/08/95 by WD using 3010
(2) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC08ICW1

340 County Road #1 PO Box 220
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-2
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	1.2	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	7.9	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	1.1	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC09HGW1

340 County Road #6, P[illegible]
Westbrook, ME 04092
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-2
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

343 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-3
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-3	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	<0.10	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/10/95	KW	2
Barium, Total	0.013	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	7.9	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	1.4	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Lead, Total	<0.005	mg/L	1.0	0.005	239.2/7421	03/09/95	KW	2
Magnesium, Total	1.5	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	0.010	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/08/95 by WD using 3010
(2) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC08ICW1

349 Cassin Road P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-3
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-3	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	2.1	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	2.7	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	0.86	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC09HGW1

345 County Road #6 | P.O. Box 770
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-3
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-3	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

345 County Road #5, PO Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-4
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-4	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	0.26	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/10/95	KW	2
Barium, Total	0.010	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	3.5	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	0.83	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Lead, Total	<0.005	mg/L	1.0	0.005	239.2/7421	03/09/95	KW	2
Magnesium, Total	1.8	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	0.018	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/08/95 by WD using 3010
(2) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC08ICW1

[illegible] County Rd. P.O. Box 770
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-4
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-4	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	0.51	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	4.8	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	0.61	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC09HGW1

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-4
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-4	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

343 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-5
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-5	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	<0.10	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/10/95	KW	2
Barium, Total	0.008	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	8.4	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	0.31	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Lead, Total	<0.005	mg/L	1.0	0.005	239.2/7421	03/09/95	KW	2
Magnesium, Total	3.9	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	0.091	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/08/95 by WD using 3010
(2) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC08ICW1

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-5
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-5	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	1.7	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	9.6	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	0.71	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC09HGW1

340 County Road #5 P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-5
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-5	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

340 County Road #6, P.O. Box 730
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-6
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-6	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	<0.10	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/14/95	KW	2
Barium, Total	0.15	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	45.	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	170	mg/L	20	0.025	200.7/6010	03/10/95	KW	1
Lead, Total	<0.25	mg/L	50	0.005	239.2/7421	03/09/95	KW	2,3
Magnesium, Total	3.0	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	1.1	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

(1) Sample Preparation on 03/08/95 by WD using 3010

(2) Sample Preparation on 03/08/95 by WD using 3020

(3) The laboratory's Practical Quantitation Level could not be achieved for this parameter due to sample composition, matrix effects, sample volume, or quantity used for analysis.

03/20/95

LJO/ejngbp(dw)/kew
LC08ICW1

340 County Road #5, P.O. Box 797
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-6
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-6	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	4.9	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	3.0	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	0.060	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	22	mg/L	5.0	0.025	200.7/6010	03/10/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)/kew
LC09HGW1

340 County Road 4B P.O. Box 770
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-6
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-6	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-7
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-7	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	0.12	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/10/95	KW	2
Barium, Total	0.040	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	87.	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	43	mg/L	10	0.025	200.7/6010	03/10/95	KW	1
Lead, Total	0.022	mg/L	1.0	0.005	239.2/7421	03/09/95	KW	2
Magnesium, Total	12.	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	0.96	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/08/95 by WD using 3010
(2) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)/kew
LC08ICW1

35 Comm. Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-7
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-7	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	6.5	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	11.	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	13	mg/L	10	0.025	200.7/6010	03/10/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)/kew
LC09HGW1

340 Convery Road #5 P.O. Box 770
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-7
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-7	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

340 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-1
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Chloroethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Methylene chloride	J2	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Acetone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
1,1-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total 1,2-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
1,1,1-Trichloroethane	J1	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.

03/20/95

LJO/jcbcas/gbp(dw)/tjg

342 Counts Road at PO Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-1
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Trichloroethene	J1	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Tetrachloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Toluene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chlorobenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/gbp(dw)/tjg

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-1
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Ethylbenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total Xylenes	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane-d4(% Recovery)	102.	%	1.0		EPA 8240	03/07/95	DR	
Toluene-d8 (% Recovery)	101.	%	1.0		EPA 8240	03/07/95	DR	
p-Bromofluorobenzene (% Recovery)	101.	%	1.0		EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/gbp(dw)/tjg

340 County Road 25 PO Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-2
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	CB	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	CB	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	CB	
Chloroethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	CB	
Methylene chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	CB	
Acetone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	CB	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	CB	
1,1-Dichloroethene	J4	µg/L	1.0	5	EPA 8240	03/07/95	CB	
1,1-Dichloroethane	J2	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Total 1,2-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
1,2-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	CB	
1,1,1-Trichloroethane	74.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.

03/20/95

LJO/jcbcas/gbp(dw)/tjg

340 County Road #5, P[illegible]
Westbrook, ME 04092
TEL: 207-874-2400
FAX 207-775-4029

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-2
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	CB	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Trichloroethene	25.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	CB	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	CB	
Tetrachloroethene	J2	µg/L	1.0	5	EPA 8240	03/07/95	CB	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Toluene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Chlorobenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/gbp(dw)/tjg

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-2
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Ethylbenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
Total Xylenes	<5.	µg/L	1.0	5	EPA 8240	03/07/95	CB	
1,2-Dichloroethane-d4 (% Recovery)	99.	%	1.0		EPA 8240	03/07/95	CB	
Toluene-d8 (% Recovery)	100.	%	1.0		EPA 8240	03/07/95	CB	
p-Bromofluorobenzene (% Recovery)	98.	%	1.0		EPA 8240	03/07/95	CB	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/gbp(dw)/tjg

342 County Road #5 P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-3
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-3	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1,2
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/09/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/09/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/09/95	DR	
Chloroethane	<10.	µg/L	1.0	10	EPA 8240	03/09/95	DR	
Methylene chloride	JB3	µg/L	1.0	10	EPA 8240	03/09/95	DR	
Acetone	<15.	µg/L	1.0	15	EPA 8240	03/09/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/09/95	DR	
1,1-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
1,1-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Total 1,2-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
1,2-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/09/95	DR	
1,1,1-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.
(2) "B" flag denotes detection of this analyte in the laboratory method blank analyzed concurrently with the sample.

03/20/95

LJO/jcbcas/dar/gbp(dw)/tjg

Westbrook, ME 04092
TEL: 207-874-2400
FAX: 207-775-4029

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-3
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-3	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/09/95	DR	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Trichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/09/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/09/95	DR	
Tetrachloroethene	J1	µg/L	1.0	5	EPA 8240	03/09/95	DR	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)/tjg

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-3
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-3	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Toluene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Chlorobenzene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Ethylbenzene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
Total Xylenes	<5.	µg/L	1.0	5	EPA 8240	03/09/95	DR	
1,2-Dichloroethane-d4(% Recovery)	98.	%	1.0		EPA 8240	03/09/95	DR	
Toluene-d8 (% Recovery)	101.	%	1.0		EPA 8240	03/09/95	DR	
p-Bromofluorobenzene (% Recovery)	95.	%	1.0		EPA 8240	03/09/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)/tjg

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-4
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-4	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Chloroethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Methylene chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Acetone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
1,1-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total 1,2-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
1,1,1-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-4
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-4	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Trichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Tetrachloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Toluene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chlorobenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Ethylbenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-4
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-4	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Total Xylenes	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane-d4 (% Recovery)	97.	%	1.0		EPA 8240	03/07/95	DR	
Toluene-d8 (% Recovery)	105.	%	1.0		EPA 8240	03/07/95	DR	
p-Bromofluorobenzene (% Recovery)	96.	%	1.0		EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-5
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-5	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Chloroethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Methylene chloride	J4	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Acetone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
1,1-Dichloroethene	61.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1-Dichloroethane	14.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total 1,2-Dichloroethene	J4	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane	J3	µg/L	1.0	5	EPA 8240	03/07/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
1,1,1-Trichloroethane	940.	µg/L	5.0	5	EPA 8240	03/07/95	DR	
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-5
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-5	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Trichloroethene	190.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Tetrachloroethene	J4	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Toluene	J1	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chlorobenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 Court Street, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-5
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-5	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Ethylbenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total Xylenes	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane-d4(% Recovery)	104.	%	1.0		EPA 8240	03/07/95	DR	
Toluene-d8 (% Recovery)	100.	%	1.0		EPA 8240	03/07/95	DR	
p-Bromofluorobenzene (% Recovery)	104.	%	1.0		EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road 49 PO Box 770
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-6
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-6	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Chloroethane	11.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Methylene chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Acetone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
1,1-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1-Dichloroethane	J2	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total 1,2-Dichloroethene	J1	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
1,1,1-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #6, P.O. Box 700
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-6
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-6	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Trichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Benzene	5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Tetrachloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Toluene	27.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chlorobenzene	J4	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-6
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-6	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Ethylbenzene	150.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total Xylenes	410.	µg/L	5.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane-d4 (% Recovery)	102.	%	1.0		EPA 8240	03/07/95	DR	
Toluene-d8 (% Recovery)	102.	%	1.0		EPA 8240	03/07/95	DR	
p-Bromofluorobenzene (% Recovery)	102.	%	1.0		EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-7
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EW-7	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1,2
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Chloroethane	290.	µg/L	2.0	10	EPA 8240	03/07/95	DR	
Methylene chloride	J2	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Acetone	J5	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
1,1-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1-Dichloroethane	39.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total 1,2-Dichloroethene	J3	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane	J1	µg/L	1.0	5	EPA 8240	03/07/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
1,1,1-Trichloroethane	J1	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.
(2) "B" flag denotes detection of this analyte in the laboratory method blank analyzed concurrently with the sample.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #6, PO Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-7
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-7	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Trichloroethene	6.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2-Trichloroethane	9.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Tetrachloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2,2-Tetrachloroethane	B74	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-7
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EW-7	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Toluene	35.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chlorobenzene	J1	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Ethylbenzene	18.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total Xylenes	49.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane-d4(% Recovery)	102.	%	1.0		EPA 8240	03/07/95	DR	
Toluene-d8 (% Recovery)	99.	%	1.0		EPA 8240	03/07/95	DR	
p-Bromofluorobenzene (% Recovery)	98.	%	1.0		EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-8
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	<0.10	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/10/95	KW	2
Barium, Total	0.009	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	9.7	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	0.80	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Lead, Total	<0.005	mg/L	1.0	0.005	239.2/7421	03/09/95	KW	2
Magnesium, Total	5.4	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	0.048	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/08/95 by WD using 3010
(2) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC08ICW1

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-8
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	2.1	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	19.	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	1.5	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC09HGW1

340 County Rd. 5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-8
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

340 County Road #5, P.O. Box 700
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-8
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1,2
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Chloroethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Methylene chloride	JB1	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Acetone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
1,1-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total 1,2-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
1,1,1-Trichloroethane	J2	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.
(2) "B" flag denotes detection of this analyte in the laboratory method blank analyzed concurrently with the sample.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #5, P.O. Box 770
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-8
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Trichloroethene	J1	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Tetrachloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-8
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
DUP-1	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Toluene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chlorobenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Ethylbenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total Xylenes	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane-d4(% Recovery)	100.	%	1.0		EPA 8240	03/07/95	DR	
Toluene-d8 (% Recovery)	104.	%	1.0		EPA 8240	03/07/95	DR	
p-Bromofluorobenzene (% Recovery)	100.	%	1.0		EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-9
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	0.10	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/10/95	KW	2
Barium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	13.	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	0.29	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Lead, Total	<0.005	mg/L	1.0	0.005	239.2/7421	03/09/95	KW	2
Magnesium, Total	2.7	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	0.049	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/08/95 by WD using 3010
(2) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC08ICW1

Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-9
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	1.2	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	7.6	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	0.93	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC09HGW1

340 County Road 5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-9
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

340 County Road #5 P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-9
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Chloroethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Methylene chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Acetone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
1,1-Dichloroethene	J2	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1-Dichloroethane	J3	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total 1,2-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
1,1,1-Trichloroethane	91.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #6 P.O. Box 700
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-9
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Trichloroethene	30.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Tetrachloroethene	J3	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Toluene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chlorobenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

349 Cour[illegible], P.O. Box 729
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-9
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
DUP-2	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Ethylbenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total Xylenes	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane-d4 (% Recovery)	104.	%	1.0		EPA 8240	03/07/95	DR	
Toluene-d8 (% Recovery)	104.	%	1.0		EPA 8240	03/07/95	DR	
p-Bromofluorobenzene (% Recovery)	99.	%	1.0		EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

347 County Road #5 PO Box 772
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-10
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EQUIP.BLANK	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Aluminum, Total	<0.10	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	1
Antimony, Total	<0.005	mg/L	1.0	0.005	204.2/7041	03/09/95	KW	1
Arsenic, Total	<0.005	mg/L	1.0	0.005	206.2/7060	03/20/95	KW	2
Barium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Beryllium, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1
Cadmium, Total	<0.010	mg/L	1.0	0.010	200.7/6010	03/09/95	KW	1
Calcium, Total	<0.050	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Chromium, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	1
Cobalt, Total	<0.030	mg/L	1.0	0.030	200.7/6010	03/10/95	KW	1
Copper, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Iron, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	1
Lead, Total	<0.005	mg/L	1.0	0.005	239.2/7421	03/09/95	KW	2
Magnesium, Total	<0.050	mg/L	1.0	0.050	200.7/6010	03/09/95	KW	1
Manganese, Total	<0.005	mg/L	1.0	0.005	200.7/6010	03/09/95	KW	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/08/95 by WD using 3010
(2) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC08ICW1

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-10
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EQUIP.BLANK	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Mercury, Total	<0.20	µg/L	1.0	0.20	245.1	03/09/95	GB	1
Nickel, Total	<0.040	mg/L	1.0	0.040	200.7/6010	03/10/95	KW	2
Potassium, Total	<0.50	mg/L	1.0	0.50	200.7/6010	03/10/95	KW	2
Selenium, Total	<0.005	mg/L	1.0	0.005	270.2/7740	03/13/95	KW	3
Silver, Total	<0.015	mg/L	1.0	0.015	200.7/6010	03/09/95	KW	2
Sodium, Total	<0.10	mg/L	1.0	0.10	200.7/6010	03/09/95	KW	2
Thallium, Total	<0.005	mg/L	1.0	0.005	279.2/7841	03/10/95	KW	3
Vanadium, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2
Zinc, Total	<0.025	mg/L	1.0	0.025	200.7/6010	03/09/95	KW	2

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/09/95 by WD using 245.1
(2) Sample Preparation on 03/08/95 by WD using 3010
(3) Sample Preparation on 03/08/95 by WD using 3020

03/20/95

LJO/ejngbp(dw)
LC09HGW1

340 County Road #6, P.O. Box 729
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-10
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
EQUIP.BLANK	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Cyanide, Total	<20	µg/L	1.0	20	335.2	03/16/95	NN	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 03/15/95 by NEN

03/20/95

LJO/ejngbp(dw)

340 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-10
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EQUIP.BLANK	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1,2
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Chloroethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Methylene chloride	JB3	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Acetone	J4	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
1,1-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total 1,2-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
1,1,1-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.
(2) "B" flag denotes detection of this analyte in the laboratory method blank analyzed concurrently with the sample.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road 49, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-10
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EQUIP.BLANK	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Trichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Tetrachloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

Westbrook, ME 04092
TEL: 207-874-2400
FAX: 207-775-4029

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Lab Number : WL-0368-10
Report Date: 03/20/95
PO No. : TBA

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
EQUIP.BLANK	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Toluene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chlorobenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Ethylbenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total Xylenes	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane-d4(% Recovery)	96.	%	1.0		EPA 8240	03/07/95	DR	
Toluene-d8 (% Recovery)	98.	%	1.0		EPA 8240	03/07/95	DR	
p-Bromofluorobenzene (% Recovery)	98.	%	1.0		EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #5, P.O. Box 170
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

Recoveries for cadmium in laboratory control samples (LCS) digested concurrently with client samples are unaffected because different solutions are used to spike the LCS, and the ratio of cadmium to arsenic is much higher in the LCS than in matrix spikes.

We intend to correct this problem for the short term by using a cadmium spiking solution that does not contain arsenic. Within the next month, we expect to switch most of our ICP analyses to a new instrument that will allow interelement correction of results, which should eliminate all interelement interference problems.

If you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact me. We appreciate your continued use of our laboratory and look forward to working with you in the future.

Sincerely,

PACE, INC.

Laura J. O'Meara

Laura J. O'Meara, Supervisor
Client Services

LJO/dmg

c Mr. T. LeCalvez, OHM Remediation Services Corp.

PACE, Inc.
Maine Laboratory
Quality Control Report

Duplicate and Matrix Spike/Matrix Spike Duplicate Results

		DUPLICATE RESULTS						*MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS*									
			Sample Measurement				Acceptance Range	Concentration or Quantity					Matrix Spike Recovery (%)				
Parameter	PACE Sample No.	Units	Rep 1	Rep 2	Mean Conc	RPD (%)	for RPD (%)	Units	Sample Only	Spike Added	Sample +Spike Dup 1	Sample +Spike Dup 2	Sample +Spike Dup 1	Sample +Spike Dup 2	Acceptance Range (%)	RPD (%)	Acceptance Range (%)

DATA QUALITY COMMENTS:

Results of all quality control measurements are within the laboratory or contract specified acceptance range except as noted. The laboratory does not use the sample duplicate and matrix spike acceptance ranges as acceptance criteria for a specific analysis. Sample duplicate and matrix spike data are used to evaluate method performance in the environmental sample matrix only. Please refer to LCS data for assessment of quality control for each parameter.

* Matrix spike recovery is outside the laboratory's specified acceptance range indicating potential sample matrix interference and potential bias of reported value for this parameter.

$ See cover letter for additional information.

PACE, Inc.
Maine Laboratory
Quality Control Report

Method Blank and Laboratory Control Sample Results

			METHOD BLANK RESULTS					*LABORATORY CONTROL SAMPLE RESULTS*					
Parameter	Date of Prep	Date of Analysis	Units	Concentration Measured in Blank		Acceptance Range	Practical Quantitation Level**	Units	True Value	Measured Value	Percent Recovered	Acceptance Range (%)	Acceptance Range (mg/kg)
Cyanide, Total	15-Mar-95	16-Mar-95	ug/L	< 20	<	20	20	ug/L	50.0	46.8	93.6	69-115	@

** Practical quantitation level is the lowest concentration measurable for samples with normal chemical and physical composition during routine laboratory operations.

DATA QUALITY COMMENTS:
Results of all quality control measurements are within the laboratory and method specified acceptance range except as noted.

@ The laboratory uses the internally established statistical 99% confidence range as the acceptance range for this LCS.

L00008

PACE, Inc.
Maine Laboratory
Quality Control Report

Duplicate and Matrix Spike/Matrix Spike Duplicate Results

		DUPLICATE RESULTS						*MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS*									
		Sample Measurements					Acceptance Range	Concentration or Quantity				Matrix Spike Recovery (%)					
Parameter	PACE Sample No.	Units	Rep 1	Rep 2	Mean Conc	RPD (%)	for RPD (%)	Units	Sample Only	Spike Added	Sample +Spike Dup 1	Sample +Spike Dup 2	Sample +Spike Dup 1	Sample +Spike Dup 2	Acceptance Range (%)	RPD (%)	Acceptance Range (%)
Cyanide, Total	WL0368-1							ug/L	<20.0	100	112	119	112	119	75-125	6.1	0-20

RPD = Relative percent difference, which is the absolute value of the difference between two replicate results divided by the mean concentration then multiplied by 100%.

DATA QUALITY COMMENTS:

Results of all quality control measurements are within the laboratory or contract specified acceptance range except as noted. The laboratory does not use the sample duplicate and matrix spike acceptance ranges as acceptance criteria for a specific analysis. Sample duplicate and matrix spike data are used to evaluate method performance in the environmental sample matrix only. Please refer to LCS data for assessment of quality control for each parameter.

PACE, Inc.
Maine Laboratory
Quality Control Report

000009

Methods, Chronology of Analysis and Method Blank Results

Volatile Analysis by GC/MS Method: 8240

Water Matrix

CHRONOLOGY

PACE-ME Sample Nos.	Date Analyzed	LCS File	Dilution Factor ~	PACE-ME Sample Nos.	Date Analyzed	LCS File	Dilution Factor ~
WL0368-1	07-Mar-95	Y7583	1.0				
WL0368-2	07-Mar-95	Y7583	1.0				
WL0368-5	07-Mar-95	Y7614	1.0				
WL0368-6	07-Mar-95	Y7614	1.0				
WL0368-7	07-Mar-95	Y7614	1.0				

METHOD BLANK RESULTS*

Compound	Conc. (ug/L)
1,1,2,2-Tetrachloroethane	J1

* Only positive hits have been included. The remaining compounds were not detected in the method blank.

~ The Dilution Factor (DF) indicates whether a sample, prepared in accordance with the analytical method protocol, was diluted prior to analysis. The Dilution Factor could also indicate that a smaller aliquot than specified in the method was utilized for sample preparation and analysis. For example, a dilution factor of 5 means that the sample was effectively diluted by a factor of 5 prior to analysis, i.e., the sample was analyzed at 20% its reported concentration.

PACE, Inc.
Maine Laboratory
Quality Control Report

000010

Methods, Chronology of Analysis and Method Blank Results

Volatile Analysis by GC/MS Method: 8240

Water Matrix

CHRONOLOGY

PACE-ME Sample Nos.	Date Analyzed	LCS File	Dilution Factor ~	PACE-ME Sample Nos.	Date Analyzed	LCS File	Dilution Factor ~
WL0368-4	07-Mar-95	Y7614	1.0				
WL0368-5DL	07-Mar-95	Y7614	5.0				
WL0368-7DL	07-Mar-95	Y7614	2.0				
WL0368-8	07-Mar-95	Y7614	1.0				
WL0368-9	07-Mar-95	Y7614	1.0				
WL0368-11	07-Mar-95	Y7614	1.0				
WL0368-1MS	07-Mar-95	Y7614	1.0				
WL0368-1MSD	07-Mar-95	Y7614	1.0				

METHOD BLANK RESULTS*

Compound	Conc. (ug/L)
Methylene Chloride	J2
Acetone	J3
1,1,2,2-Tetrachloroethane	J4

* Only positive hits have been included. The remaining compounds were not detected in the method blank.

~ The Dilution Factor (DF) indicates whether a sample, prepared in accordance with the analytical method protocol, was diluted prior to analysis. The Dilution Factor could also indicate that a smaller aliquot than specified in the method was utilized for sample preparation and analysis. For example, a dilution factor of 5 means that the sample was effectively diluted by a factor of 5 prior to analysis, i.e., the sample was analyzed at 20% its reported concentration.

PACE, Inc.
Maine Laboratory
Quality Control Report

000011

Methods, Chronology of Analysis and Method Blank Results

Volatile Analysis by GC/MS Method: 8240

Water Matrix

CHRONOLOGY

PACE-ME Sample Nos.	Date Analyzed	LCS File	Dilution Factor ~	PACE-ME Sample Nos.	Date Analyzed	LCS File	Dilution Factor ~
WL0368-6DL	07-Mar-95	Y7638	5.0				
WL0368-10	07-Mar-95	Y7638	1.0				

METHOD BLANK RESULTS*

Compound	Conc. (ug/L)
Methylene Chloride	J3
1,1,2,2-Tetrachloroethane	J1

* Only positive hits have been included. The remaining compounds were not detected in the method blank.

~ The Dilution Factor (DF) indicates whether a sample, prepared in accordance with the analytical method protocol, was diluted prior to analysis. The Dilution Factor could also indicate that a smaller aliquot than specified in the method was utilized for sample preparation and analysis. For example, a dilution factor of 5 means that the sample was effectively diluted by a factor of 5 prior to analysis, i.e., the sample was analyzed at 20% its reported concentration.

PACE, Inc.
Maine Laboratory
Quality Control Report

000012

Methods, Chronology of Analysis and Method Blank Results

Volatile Analysis by GC/MS Method: 8240

Water Matrix

CHRONOLOGY

PACE-ME Sample Nos.	Date Analyzed	LCS File	Dilution Factor ~	PACE-ME Sample Nos.	Date Analyzed	LCS File	Dilution Factor ~
WL0368-3	09-Mar-95	Y7674	1.0				

METHOD BLANK RESULTS*

Compound	Conc. (ug/L)
Methylene Chloride	J3
Acetone	J5

* Only positive hits have been included. The remaining compounds were not detected in the method blank.

~ The Dilution Factor (DF) indicates whether a sample, prepared in accordance with the analytical method protocol, was diluted prior to analysis. The Dilution Factor could also indicate that a smaller aliquot than specified in the method was utilized for sample preparation and analysis. For example, a dilution factor of 5 means that the sample was effectively diluted by a factor of 5 prior to analysis, i.e., the sample was analyzed at 20% its reported concentration.

PACE, Inc.
Maine Laboratory
Quality Control Report

Laboratory Control Sample Results

Volatile Organics by GC/MS Method: 8240

Water Matrix

Date of Analysis: 01-Mar-95 Files: Y7583

Compound	Units	Spike Conc.	LCS Measured Conc.	LCS Dup. Measured Conc.	LCS % Recovery	LCS Dup. % Recovery	Recovery Acceptance Range (%)*	RPD (%)	RPD Acceptance Range (%)*
1,1-Dichloroethene	ug/l	50	55.1	51.2	110	102	53-136	7.3	0-17
Trichloroethene	ug/l	50	49.7	49.1	99.4	98.2	76-119	1.2	0-23
Benzene	ug/l	50	48.3	46.2	96.6	92.4	78-128	4.4	0-26
Toluene	ug/l	50	54.9	52.5	110	105	75-121	4.5	0-24
Chlorobenzene	ug/l	50	53.1	53.3	106	107	74-125	0.38	0-24

* The laboratory uses the internally established statistical 99% confidence ranges for recovery and relative percent difference (RPD) as the acceptance criteria for this LCS/LCSD.

PACE, Inc.
Maine Laboratory
Quality Control Report

Laboratory Control Sample Results

Volatile Organics by GC/MS Method: 8240

Water Matrix

Date of Analysis: 06-Mar-95 Files: Y7614

Compound	Units	Spike Conc.	LCS Measured Conc.	LCS Dup. Measured Conc.	LCS % Recovery	LCS Dup. % Recovery	Recovery Acceptance Range (%)*	RPD (%)	RPD Acceptance Range (%)*
1,1-Dichloroethene	ug/l	50	45.0	44.4	90.0	88.8	53-136	1.3	0-17
Trichloroethene	ug/l	50	46.1	47.9	92.2	95.8	76-119	3.8	0-23
Benzene	ug/l	50	51.2	53.7	102	107	78-128	4.8	0-26
Toluene	ug/l	50	46.8	47.8	93.6	95.6	75-121	2.1	0-24
Chlorobenzene	ug/l	50	46.0	46.4	92.0	92.8	74-125	0.87	0-24

* The laboratory uses the internally established statistical 99% confidence ranges for recovery and relative percent difference (RPD) as the acceptance criteria for this LCS/LCSD.

PACE, Inc.
Maine Laboratory
Quality Control Report

Laboratory Control Sample Results

Volatile Organics by GC/MS Method: 8240

Water Matrix

Date of Analysis: 07-Mar-95 Files: Y7638

Compound	Units	Spike Conc.	LCS Measured Conc.	LCS Dup. Measured Conc.	LCS % Recovery	LCS Dup. % Recovery	Recovery Acceptance Range (%)*	RPD (%)	RPD Acceptance Range (%)*
1,1-Dichloroethene	ug/l	50	48.8	48.0	97.6	96.0	53-136	1.7	0-17
Trichloroethene	ug/l	50	48.0	45.8	96.0	91.6	76-119	4.7	0-23
Benzene	ug/l	50	48.0	46.1	96.0	92.2	78-128	4.0	0-26
Toluene	ug/l	50	51.5	48.4	103	96.8	75-121	6.2	0-24
Chlorobenzene	ug/l	50	49.5	47.8	99.0	95.6	74-125	3.5	0-24

* The laboratory uses the internally established statistical 99% confidence ranges for recovery and relative percent difference (RPD) as the acceptance criteria for this LCS/LCSD.

PACE, Inc.
Maine Laboratory
Quality Control Report

Laboratory Control Sample Results

Volatile Organics by GC/MS Method: 8240

Water Matrix

Date of Analysis: 08-Mar-95 Files: Y7674

Compound	Units	Spike Conc.	LCS Measured Conc.	LCS Dup. Measured Conc.	LCS % Recovery	LCS Dup. % Recovery	Recovery Acceptance Range (%)*	RPD (%)	RPD Acceptance Range (%)*
1,1-Dichloroethene	ug/l	50	43.6	46.5	87.2	93.0	53-136	6.4	0-17
Trichloroethene	ug/l	50	47.3	48.8	94.6	97.6	76-119	3.1	0-23
Benzene	ug/l	50	47.2	50.0	94.4	100	78-128	5.8	0-26
Toluene	ug/l	50	46.9	49.8	93.8	99.6	75-121	6.0	0-24
Chlorobenzene	ug/l	50	45.2	49.4	90.4	98.8	74-125	8.9	0-24

* The laboratory uses the internally established statistical 99% confidence ranges for recovery and relative percent difference (RPD) as the acceptance criteria for this LCS/LCSD.

PACE, Inc.
Maine Laboratory
Quality Control Report

Matrix Spike/Matrix Spike Duplicate Results

Volatile Organics by GC/MS Method: 8240

Water Matrix

PACE Sample No. Spiked: WL0368-1

Compound	Units	Spike Conc.	Sample Conc.	MS Measured Conc.	MSD Measured Conc.	Theoretical Sample Spike Conc.	MS % Recovery	MSD % Recovery	Recovery Acceptance Range (%)*	RPD (%)	RPD Acceptance Range (%)*
1,1-Dichloroethene	ug/l	50	<5	61.2	53.1	50	122	106	61-145	14	0-14
Trichloroethene	ug/l	50	J1	57.3	56.8	50	113	112	71-120	0.89	0-14
Benzene	ug/l	50	<5	57.2	57.2	50	114	114	76-127	0.0	0-11
Toluene	ug/l	50	<5	51.9	56.1	50	104	112	76-125	7.8	0-13
Chlorobenzene	ug/l	50	<5	61.0	58.5	50	122	117	75-130	4.2	0-13

* Acceptance ranges are obtained when available from the applicable US EPA analytical method. These ranges are based upon method performance data generated from the analysis of quality control check samples and not actual environmental samples. The laboratory does not use the MS/MSD acceptance ranges as quality control acceptance criteria; the MS/MSD data are used to evaluate method performance for the environmental sample matrix. Please refer to LCS/LCSD data for assessment of quality control for this method.

"J" flag denotes an estimated value. The analyte was detected in the sample at a concentration greater than the measured detection limit but less than the laboratory's Practical Quantitation Level.

ORDER NO WL-0368

Project Manager: Laura J. O'Meara
ORDER DATE: 03/06/95

REPORT TO: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

000018

PHONE: 609/588-6353
FAX: 609/588-6403
DUE: 24 MAR

INVOICE: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

PHONE: 609/588-6353
PO: TBA

SAMPLED BY: T. LECALVEZ DELIVERED BY: G. PEOPLES DISPOSE: AFTER 05 APR

ITEM	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
1	WL0368-1	EW-1	03 MAR 1050	03 MAR	AQ

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Target Analyte List Metals, Total		1	165.00	165.00
Cyanide, Total	335.2	1	30.00	30.00
TCL Volatile Organics by USEPA 8240	EPA 8240	1	170.00	170.00
VOA Matrix Spike Sample		1	170.00	170.00
VOA MS Duplicate Sample		1	170.00	170.00
Elements Matrix Spike Sample		1	165.00	165.00
Elements MS Duplicate Sample		1	165.00	165.00
Wet Chemistry Matrix Spike Sample		1	30.00	30.00
Wet Chemistry Matrix Spike Duplicate		1	30.00	30.00
TOTALS		1	1095.00	1095.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
2	WL0368-2	EW-2	03 MAR 1100	03 MAR	AQ
	WL0368-3	EW-3	03 MAR 1130		
	WL0368-4	EW-4	03 MAR 1140		
	WL0368-5	EW-5	03 MAR 1150		
	WL0368-6	EW-6	03 MAR 1245		
	WL0368-7	EW-7	03 MAR 1230		
	WL0368-8	DUP-1	03 MAR 1155		
	WL0368-9	DUP-2	03 MAR 1110		
	WL0368-10	EQUIP.BLANK	03 MAR 1040		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Target Analyte List Metals, Total		9	165.00	1485.00
Cyanide, Total	335.2	9	30.00	270.00
TCL Volatile Organics by USEPA 8240	EPA 8240	9	170.00	1530.00
TOTALS		9	365.00	3285.00

LABORATORY ORDER CONTINUED ON PAGE 2

SJC030795

ORDER NO WL-0368

Project Manager: Laura J. O'Meara
ORDER DATE: 03/06/95
PHONE: 609/588-6353
000019 FAX: 609/588-6403
DUE: 24 MAR

REPORT TO: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

INVOICE: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

PHONE: 609/588-6353
PO: TBA

SAMPLED BY: T. LECALVEZ DELIVERED BY: G. PEOPLES DISPOSE: AFTER 05 APR

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
3	WL0368-11	TRIP BLANK	03 MAR	03 MAR	AQ

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
TCL Volatile Organics by USEPA 8240	EPA 8240	1	170.00	170.00

ORDER NOTE: BNAS EXTRACTION WELLS
QC-III W/O RD

INVOICE: With Report

TOTAL ORDER AMOUNT $4,550.00
This is NOT an Invoice

GBP/LJO/WEST.GBP(dw)
03-07 Please contact PACE, Inc. promptly if you have any questions.

Pace INCORPORATED
ENVIRONMENTAL LABORATORIES

21[illegible]41

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: OHM CORP
Address: 200 HORIZON CENTER BLVD
TRENTON NJ. 08691
Phone: 1-609-588-6353

Report To: T. LeCALVEZ
Bill To: See P.O #
P.O. # / Billing Reference:
Project Name / No.:

Pace Client No.:
Pace Project Manager:
Pace Project No.:
*Requested Due Date:

Sampled By (PRINT): THOMAS M LeCALVEZ
Sampler Signature:
Date Sampled: 030395

5 DAY 030315
T.A.T.

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: VOA's 8240	TAL Inorganics SVOA-8270	REMARKS
1	EW-1	1050	WATER	1						X	X	
2	EW-2	1055		2						X	X	
3	EW-3	1130		3						X	X	
4	EW-4	1140		4						X	X	
5	EW-5	1150		5						X	X	
6	EW-6	1245		6						X	X	
7	EW-7	1230		7						X	X	
8	DUP-1	1055		8						X	X	

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-8			030315	1415

Additional Comments: QC - II w/o RD

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

21[redacted]542

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: OHM CORP
Address: 200 HORIZON CENTER BLVD.
TRENTON NJ 08691
Phone: 1-609-588-6353

Report To: T. LECALVEZ
Bill To:
P.O. # / Billing Reference
Project Name / No.

Pace Client No.
Pace Project Manager
Pace Project No.
*Requested Due Date:

Sampled By (PRINT): THOMAS LECALVEZ
Sampler Signature: [signature]
Date Sampled: 3-3-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA			ANALYSES REQUEST: VOL 8240	TAL INORGANIC	REMARKS
1	DUP-2	1110	WATER	9								X	X	
2	EQUIP. BLANK	1040	↓	10								X	X	
3	TRIP BLANK			11								X		
4														
5														
6														
7														
8														

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-2	[signature]	[signature]	030395	1415

Additional Comments: QC-III w/o R.D.

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

March 21, 1995

Mr. Arron Essel
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Dear Mr. Essel:

WORK ORDER NUMBER: WL0368

Please find enclosed the Report of Analysis (ROA) for the samples received by the laboratory on March 3, 1995. This cover letter is an integral part of the ROA.

Until recently, we have analyzed for cadmium by inductively coupled plasma (ICP) emission spectroscopy using the 214.438 nm cadmium emission line. We discovered that emission from the nearby iron line at 214.519 nm was occasionally causing small false-positives for cadmium in samples containing large amounts of iron. Since it is not possible to correct for interelement interferences using our current Perkin Elmer emission spectrometer, we were forced to choose another cadmium emission line to avoid the iron interference. Therefore, we recently began to use the 228.802 nm cadmium emission line for all cadmium ICP analyses.

The 228.802 nm cadmium line is actually slightly more sensitive than the 214.438 emission line, but we have noticed that cadmium matrix spike recoveries are high (approximately 200%) for cadmium-free samples when cadmium is analyzed at the 228.802 nm line. This was the case for Pace Sample No. WL0368-1: cadmium was not detected in the sample itself, and the cadmium recoveries for the matrix spike and matrix spike duplicate were 214% and 220%, respectively. An investigation of this phenomenon has shown that the positive bias is caused by an uncorrected interference from the nearby arsenic 228.812 nm emission line. Although the sample itself contains no detectable arsenic, the matrix spiking solution produces an arsenic concentration of 2.0 mg/L in the matrix spike samples. Investigation has shown that 2.0 mg/L of arsenic produces a false positive for cadmium of approximately 0.05 mg/L at the 228.802 emission line. Since 0.050 mg/L of cadmium is added to the matrix spike samples, the added false-positive from the arsenic emission line produces a spike recovery of approximately 200%. Recoveries for cadmium in laboratory control samples (LCS) digested

340 County Road 49 PO Box 770
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

Client: OHM Remediation Services Corp., Work Order: WL0368

ANALYSIS AND QUALITY CONTROL DOCUMENTATION

Prepared By:

PACE, Inc.
Maine Laboratory

20-Mar-95

Reviewed and Approved by: Deborah J Nadeau
Laboratory Quality Assurance

PACE, Inc.
Maine Laboratory
Quality Control Report

LEVEL III REPORT

Level III documentation consists of the following components for specific types of analyses:

Section	Type of Documentation
INORGANIC ANALYSES FOR METALS	
	o METHOD BLANK AND LABORATORY CONTROL SAMPLE RESULTS
	o MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS
INORGANIC ANALYSES FOR NON-METALS	
	o METHOD BLANK AND LABORATORY CONTROL SAMPLE RESULTS
	o MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS
ORGANIC ANALYSES BY GC/MS	
	o METHODS, CHRONOLOGY OF ANALYSIS AND METHOD BLANK RESULTS
	o LABORATORY CONTROL SAMPLE RESULTS
	o MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS
CHAIN OF CUSTODY	
	o CONFIRMATION
	o CHAIN OF CUSTODY RECORDS

PACE, Inc.
Maine Laboratory
Quality Control Report

Method Blank and Laboratory Control Sample Results

			METHOD BLANK RESULTS				*LABORATORY CONTROL SAMPLE RESULTS*					
Parameter	Date of Prep	Date of Analysis	Units	Concentration Measured in Blank	Acceptance Range	Practical Quantitation Level*	Units	True Value	Measured Value	Percent Recovered	Acceptance Range (%)	Acceptance Range (mg/kg)
Aluminum	08-Mar-95	09-Mar-95	mg/L	< 0.100	< 0.100	0.100	mg/L	10.0	10.5	105	80-120	
Antimony	08-Mar-95	09-Mar-95	mg/L	< 0.005	< 0.005	0.005	mg/L	0.050	0.046	92.0	80-120	
Arsenic	08-Mar-95	09-Mar-95	mg/L	< 0.005	< 0.005	0.005	mg/L	0.025	0.026	104	80-120	
Barium	08-Mar-95	09-Mar-95	mg/L	< 0.005	< 0.005	0.005	mg/L	10.0	10.4	104	80-120	
Beryllium	08-Mar-95	09-Mar-95	mg/L	< 0.005	< 0.005	0.005	mg/L	0.250	0.262	105	80-120	
Cadmium	08-Mar-95	09-Mar-95	mg/L	< 0.010	< 0.010	0.010	mg/L	2.50	2.52	101 $	80-120	
Calcium	08-Mar-95	09-Mar-95	mg/L	< 0.050	< 0.100	0.050	mg/L	25.0	26.4	106	80-120	
Chromium	08-Mar-95	09-Mar-95	mg/L	< 0.015	< 0.015	0.015	mg/L	1.00	1.07	107	80-120	
Cobalt	08-Mar-95	09-Mar-95	mg/L	< 0.030	< 0.030	0.030	mg/L	2.50	2.72	109	80-120	
Copper	08-Mar-95	09-Mar-95	mg/L	< 0.025	< 0.025	0.025	mg/L	1.25	1.32	106	80-120	
Iron	08-Mar-95	09-Mar-95	mg/L	< 0.025	< 0.050	0.025	mg/L	5.00	5.34	107	80-120	
Lead	08-Mar-95	09-Mar-95	mg/L	< 0.005	< 0.005	0.005	mg/L	0.025	0.023	92.0	80-120	
Magnesium	08-Mar-95	09-Mar-95	mg/L	< 0.050	< 0.050	0.050	mg/L	25.0	26.6	106	80-120	
Manganese	08-Mar-95	09-Mar-95	mg/L	< 0.005	< 0.005	0.005	mg/L	2.50	2.64	106	80-120	
Mercury	09-Mar-95	09-Mar-95	ug/L	< 0.20	< 0.20	0.20	ug/L	10.0	9.37	93.7	80-120	
Nickel	08-Mar-95	09-Mar-95	mg/L	< 0.040	< 0.040	0.040	mg/L	2.50	2.65	106	80-120	
Potassium	08-Mar-95	09-Mar-95	mg/L	< 0.500	< 0.500	0.500	mg/L	25.0	24.4	97.6	80-120	
Selenium	08-Mar-95	10-Mar-95	mg/L	< 0.005	< 0.005	0.005	mg/L	0.0125	0.0123	98.4	80-120	
Silver	08-Mar-95	09-Mar-95	mg/L	< 0.015	< 0.015	0.015	mg/L	1.25	1.30	104	80-120	
Sodium	08-Mar-95	09-Mar-95	mg/L	< 0.100	< 0.200	0.100	mg/L	25.0	25.6	102	80-120	
Thallium	08-Mar-95	10-Mar-95	mg/L	< 0.005	< 0.005	0.005	mg/L	0.020	0.018	90.0	80-120	
Vanadium	08-Mar-95	09-Mar-95	mg/L	< 0.025	< 0.025	0.025	mg/L	2.50	2.64	106	80-120	
Zinc	08-Mar-95	09-Mar-95	mg/L	< 0.025	< 0.025	0.025	mg/L	2.50	2.63	105	80-120	

* Practical quantitation level is the lowest concentration measurable for samples with normal chemical and physical composition during routine laboratory operations.

PACE, Inc.
Maine Laboratory
Quality Control Report

Method Blank and Laboratory Control Sample Results

			METHOD BLANK RESULTS				*LABORATORY CONTROL SAMPLE RESULTS*					
Parameter	Date of Prep	Date of Analysis	Units	Concentration Measured in Blank	Acceptance Range	Practical Quantitation Level*	Units	True Value	Measured Value	Percent Recovered	Acceptance Range (%)	Acceptance Range (mg/kg)

DATA QUALITY COMMENTS:
Results of all quality control measurements are within the laboratory and method specified acceptance range except as noted.

$See cover letter for additional information.

PACE, Inc.
Maine Laboratory
Quality Control Report

Duplicate and Matrix Spike/Matrix Spike Duplicate Results

DUPLICATE RESULTS | *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS*

Parameter	PACE Sample No.	Sample Measurement Units	Rep 1	Rep 2	Mean Conc	RPD (%)	Acceptance Range for RPD (%)	Concentration or Quantity Units	Sample Only	Spike Added	Sample +Spike Dup 1	Sample +Spike Dup 2	Matrix Spike Recovery (%) Sample +Spike Dup 1	Sample +Spike Dup 2	Acceptance Range (%)	RPD (%)	Acceptance Range (%)
Aluminum	WL0368-1							mg/L	0.108	2.00	2.29	2.24	109	107	75-125	2.3	0-20
Antimony	WL0368-1							mg/L	<0.005	0.100	0.101	0.105	101	105	75-125	3.9	0-20
Arsenic	WL0368-1							mg/L	<0.005	0.040	0.043	0.040	107	100	75-125	7.2	0-20
Barium	WL0368-1							mg/L	0.008	2.00	2.20	2.28	110	114	75-125	3.6	0-20
Beryllium	WL0368-1							mg/L	<0.005	0.050	0.053	0.052	106	104	75-125	1.9	0-20
Cadmium	WL0368-1							mg/L	<0.010	0.050	0.107	0.110	214 $	220 $	75-125	4.1	0-20
Calcium	WL0368-1							mg/L	10.9	2.00	12.4	12.6	75.0	85.0	75-125	12	0-20
Chromium	WL0368-1							mg/L	<0.015	0.200	0.216	0.217	108	109	75-125	0.46	0-20
Cobalt	WL0368-1							mg/L	<0.030	0.500	0.467	0.467	93.4	93.4	75-125	0.0	0-20
Copper	WL0368-1							mg/L	<0.025	0.250	0.293	0.267	117	107	75-125	9.3	0-20
Iron	WL0368-1							mg/L	0.918	1.00	1.92	1.86	100	94.2	75-125	6.2	0-20
Lead	WL0368-1							mg/L	<0.005	0.020	0.019	0.019	95.0	95.0	75-125	0.0	0-20
Magnesium	WL0368-1							mg/L	6.13	4.00	10.2	10.3	102	104	75-125	2.4	0-20
Manganese	WL0368-1							mg/L	0.054	0.500	0.615	0.594	112	108	75-125	3.8	0-20
Mercury	WL0368-1							ug/L	<0.20	1.00	0.966	0.974	96.6	97.4	75-125	0.82	0-20
Nickel	WL0368-1							mg/L	<0.040	0.500	0.490	0.478	98.0	95.6	75-125	2.5	0-20
Potassium	WL0368-1							mg/L	2.12	20.0	22.5	23.1	102	105	75-125	2.9	0-20
Selenium	WL0368-1							mg/L	<0.005	0.010	0.009	0.009	90.0	90.0	75-125	0.0	0-20
Silver	WL0368-1							mg/L	<0.015	0.050	0.052	0.043	104	86.0	75-125	19	0-20
Sodium	WL0368-1							mg/L	21.4	6.00	26.6	26.4	86.7	83.3	75-125	3.9	0-20
Thallium	WL0368-1							mg/L	<0.005	0.050	0.053	0.060	106	120	75-125	12	0-20
Vanadium	WL0368-1							mg/L	<0.025	0.500	0.548	0.539	110	108	75-125	1.7	0-20
Zinc	WL0368-1							mg/L	1.35	0.500	1.78	1.72	86.0	74.0 *	75-125	15	0-20

RPD = Relative percent difference, which is the absolute value of the difference between two duplicate results divided by the mean concentration then multiplied by 100%.

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-11
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
TRIP BLANK	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Carbon tetrachloride	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Vinyl acetate	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Bromodichloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloropropane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
cis-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Trichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Dibromochloromethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Benzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
trans-1,3-Dichloropropene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Bromoform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
4-Methyl-2-pentanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
2-Hexanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Tetrachloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1,2,2-Tetrachloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #5, P.O. Box 720
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-11
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
TRIP BLANK	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Toluene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chlorobenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Ethylbenzene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Styrene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total Xylenes	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane-d4(% Recovery)	103.	%	1.0		EPA 8240	03/07/95	DR	
Toluene-d8 (% Recovery)	103.	%	1.0		EPA 8240	03/07/95	DR	
p-Bromofluorobenzene (% Recovery)	102.	%	1.0		EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

03/20/95

LJO/jcbcas/dar/gbp(dw)

Respectfully submitted,
PACE, INC.
Laura J. O'Meara
Laura J. O'Meara
Supervisor, Client Services

340 County Road 4B, P.O. Box 730
Westbrook, ME 04098
TEL: 207-874-2400
FAX 207-775-4029

PACE INCORPORATED
New England-ME Laboratory (207) 874-2400
CONFIRMATION

ORDER NO WL-0368

Project Manager: Laura J. O'Meara
ORDER DATE: 03/06/95

REPORT TO: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

PHONE: 609/588-6353
FAX: 609/588-6403
DUE: 24 MAR

INVOICE: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

PHONE: 609/588-6353
PO: TBA

SAMPLED BY: T. LECALVEZ DELIVERED BY: G. PEOPLES DISPOSE: AFTER 05 APR

ITEM	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
1	WL0368-1	EW-1	03 MAR 1050	03 MAR	AQ

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Target Analyte List Metals, Total		1	165.00	165.00
Cyanide, Total	335.2	1	30.00	30.00
TCL Volatile Organics by USEPA 8240	EPA 8240	1	170.00	170.00
VOA Matrix Spike Sample		1	170.00	170.00
VOA MS Duplicate Sample		1	170.00	170.00
Elements Matrix Spike Sample		1	165.00	165.00
Elements MS Duplicate Sample		1	165.00	165.00
Wet Chemistry Matrix Spike Sample		1	30.00	30.00
Wet Chemistry Matrix Spike Duplicate		1	30.00	30.00
TOTALS		1	1095.00	1095.00

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
2	WL0368-2	EW-2	03 MAR 1100	03 MAR	AQ
	WL0368-3	EW-3	03 MAR 1130		
	WL0368-4	EW-4	03 MAR 1140		
	WL0368-5	EW-5	03 MAR 1150		
	WL0368-6	EW-6	03 MAR 1245		
	WL0368-7	EW-7	03 MAR 1230		
	WL0368-8	DUP-1	03 MAR 1155		
	WL0368-9	DUP-2	03 MAR 1110		
	WL0368-10	EQUIP.BLANK	03 MAR 1040		

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
Target Analyte List Metals, Total		9	165.00	1485.00
Cyanide, Total	335.2	9	30.00	270.00
TCL Volatile Organics by USEPA 8240	EPA 8240	9	170.00	1530.00
TOTALS		9	365.00	3285.00

LABORATORY ORDER CONTINUED ON PAGE 2

030795

ORDER NO WL-0368

Project Manager: Laura J. O'Meara
ORDER DATE: 03/06/95

REPORT TO: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

PHONE: 609/588-6353
FAX: 609/588-6403
DUE: 24 MAR

INVOICE: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

PHONE: 609/588-6353
PO: TBA

SAMPLED BY: T. LECALVEZ DELIVERED BY: G. PEOPLES DISPOSE: AFTER 05 APR

	LOG NUMBER	SAMPLE DESCRIPTION	SAMPLED DATE/TIME	RECEIVED	MATRIX
3	WL0368-11	TRIP BLANK	03 MAR	03 MAR	AQ

DETERMINATION	METHOD	QTY	PRICE	AMOUNT
TCL Volatile Organics by USEPA 8240	EPA 8240	1	170.00	170.00

ORDER NOTE: BNAS EXTRACTION WELLS
QC-III W/O RD

INVOICE: With Report

TOTAL ORDER AMOUNT $4,550.00
This is NOT an Invoice

GBP/LJO/WEST.GBP(dw)
03-07 Please contact PACE, Inc. promptly if you have any questions.

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

21[redacted]541

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: OHM CORP
Address: 200 HORIZON CENTER BLVD
TRENTON NJ. 08691
Phone: 1-609-588-6353

Report To: T. LeCALVEZ
Bill To: See P.O #
P.O. # / Billing Reference:
Project Name / No.:

Pace Client No.:
Pace Project Manager:
Pace Project No.:
*Requested Due Date:

Sampled By (PRINT): THOMAS M LECALVEZ
Sampler Signature:
Date Sampled: 030395

5 DAY T.A.T. 030395

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: VOCs 8240	TAL inorganics 3W-846	REMARKS
1	EW-1	1050	WATER	1						X	X	
2	EW-2	1100		2						X	X	
3	EW-3	1130		3						X	X	
4	EW-4	1140		4						X	X	
5	EW-5	1150		5						X	X	
6	EW-6	1245		6						X	X	
7	EW-7	1230		7						X	X	
8	DUP-1	1055		8						X	X	

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

Additional Comments: QC - EE w/o RD

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-8			030395	1415

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

Pace INCORPORATED
ENVIRONMENTAL LABORATORIES

21[illegible]542

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: OHM CORP
Address: 200 HORIZON CENTER BLVD.
TRENTON NJ 08691
Phone: 1-609-538-6353

Report To: T. LECALVEZ
Bill To:
P.O. # / Billing Reference
Project Name / No.

Pace Client No.
Pace Project Manager
Pace Project No.
*Requested Due Date:

Sampled By (PRINT): THOMAS LECALVEZ
Sampler Signature: Thomas LeCalvez
Date Sampled: 3-3-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA			ANALYSES REQUEST: VOL 8240	TAL INORGANIC	REMARKS
1	DUP-2	1110	WATER	9								X	X	
2	EQUIP. BLANK	1040	↓	10								X	X	
3	TRIP BLANK			11								X		
4														
5														
6														
7														
8														

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

Additional Comments: QC-III w/6 R.D.

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-2	Thomas LeCalvez			
		[illegible]	030395	1415

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

CLIENT: AARON ESSEL
OHM Remediation Services Corp.
200 Horizon Center Blvd.
Trenton, NJ 08650

Lab Number : WL-0368-11
Report Date: 03/20/95
PO No. : TBA

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
TRIP BLANK	Aqueous	T. LECALVEZ	03/03/95	03/03/95

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
TCL Volatile Organics by USEPA 8240								1,2
Chloromethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Bromomethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Vinyl chloride	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Chloroethane	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Methylene chloride	JB5	µg/L	1.0	10	EPA 8240	03/07/95	DR	
Acetone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
Carbon disulfide	<10.	µg/L	1.0	10	EPA 8240	03/07/95	DR	
1,1-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,1-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Total 1,2-Dichloroethene	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
Chloroform	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
1,2-Dichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	
2-Butanone	<15.	µg/L	1.0	15	EPA 8240	03/07/95	DR	
1,1,1-Trichloroethane	<5.	µg/L	1.0	5	EPA 8240	03/07/95	DR	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) "J" flag denotes an estimated value less than the Laboratory's Practical Quantitation Level.
(2) "B" flag denotes detection of this analyte in the laboratory method blank analyzed concurrently with the sample.

03/20/95

LJO/jcbcas/dar/gbp(dw)

340 County Road #5, P.O. Box 729
Westbrook, ME 04098
TEL: 207-874-2400
FAX: 207-775-4029